

**A Synopsis  
of the Genus *Rhopalosiphum*  
in Canada  
(Homoptera : Aphididae)**

*by*

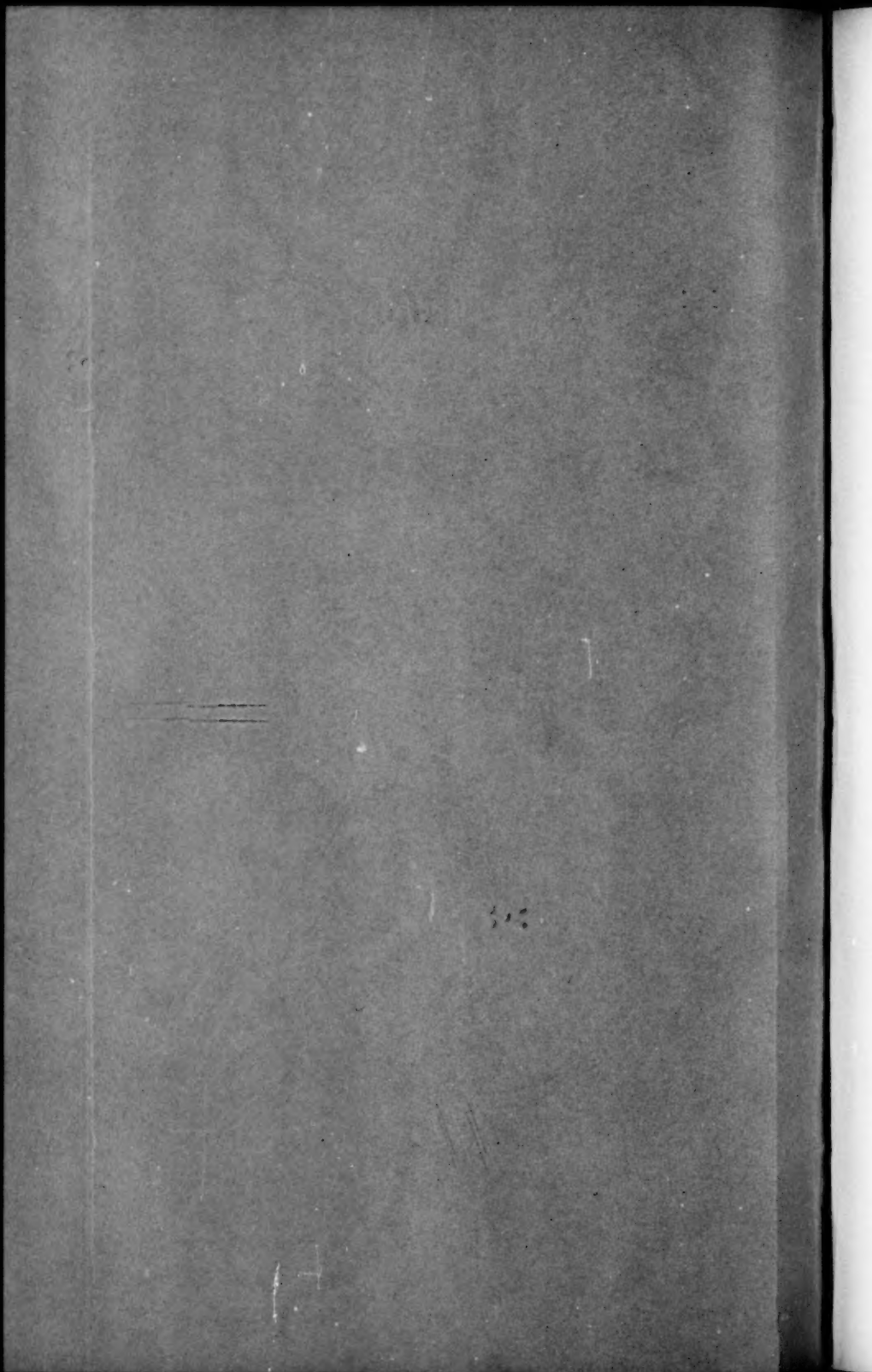
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**THE CANADIAN ENTOMOLOGIST**

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## A Synopsis of the Genus *Rhopalosiphum* in Canada (Homoptera : Aphididae)

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### Abstract

Descriptions of nearly all stages, and notes on the life histories of ten species of *Rhopalosiphum* Koch are offered. This includes all but two of the species known to occur in North America. Three are described as new. The group as a whole is of little economic importance with the exceptions of *R. maidis* (Fitch) and *R. padi* (L.) which are sometimes serious pests of cereal crops and have been shown to be capable of transmitting virus diseases. Keys for nearly all stages are provided.

### Introduction

The main objectives of this work are to list the species of *Rhopalosiphum* Koch that occur in Canada, to characterize each species and provide keys that will aid in distinguishing them, with emphasis on the grass infesting forms, and to summarize available information on life cycles for the species in the region under consideration.

The genus *Rhopalosiphum* is comprised of aphids that characteristically overwinter on Pomeae or Prunae and spend the summer on grasses, sedges and some semiaquatic plants. The group is of little economic importance with the exceptions of *Rhopalosiphum padi* (L.) and *Rhopalosiphum maidis* (Fitch) which have been shown to be capable of transmitting virus diseases in grains, and which sometimes occur on cereal crops in large enough numbers to constitute a serious pest through feeding alone. Several other species of *Rhopalosiphum* are also associated with grains, at least experimentally, and there has been some confusion as to what species are concerned. Available descriptions are inadequate and in North America the so-called apple-grain aphid is a mixture of at least three species.

There has been little comparative work done on the members of this genus. Palmer (1952) reviewed the species of the Rocky Mountain Region; Hottes and Frison (1931) listed the species that occur in Illinois; Cottier (1953) reviewed the species of New Zealand; Börner (1952) listed the species known to occur in Central Europe; Theobald (1927) listed and described the species in Britain and Rogerson (1947) published detailed comparative accounts of the life cycles of two species known to occur in Britain.

Ten species are treated in this work of which three are described as new. Notes on two more, relatively rare ones, have been added as they occur in North America and should occur in Canada.

### General Biology

Although a comparative study of the life histories was not one of the prime objectives of this work it was necessary to try to rear each species in order to associate accurately the grass infesting stages with those on the winter host. This was done by placing fundatrices on caged, potted saplings or seedlings of the winter, or primary, host and adding several species of grasses and sedges. The grasses and sedges used were *Triticum x aestivum* L., *Avena sativa* L., *Hordeum vulgare* L., *Secale cereale* L., *Zea mays* L., *Poa* sp., *Agropyron* sp. and *Scirpus* sp. *Typha* sp. was also used for species that had previously been associated with this plant. This method could not be used for all of the species studied, as

fundatrices could not be found for several of them. All material used in these experiments was collected near Ottawa, Ontario.

Various names have been given to the stages in the life cycle of aphids, but those listed below were found to be the most convenient points of reference for this work (Fig. 1):

1. Fundatrix: Occurring on winter host in the spring. Usually with fewer antennal segments than in following stages and lateral abdominal tubercles normally present only on segments I and VII.

2. Fundatrigeniae: Apterous viviparous forms produced on the winter host by the fundatrix. Similar to the fundatrix but usually with well developed inter-segmental sclerites and often with lateral tubercles on most of the abdominal segments.

3. Spring Migrants: Winged viviparous forms produced by either fundatrix or fundatrigeniae.

4. Alienicolae: Apterous and alate viviparous generations produced on the summer or secondary host. Similar to spring migrants and fundatrigeniae but the chaetotaxy and colour are usually different.

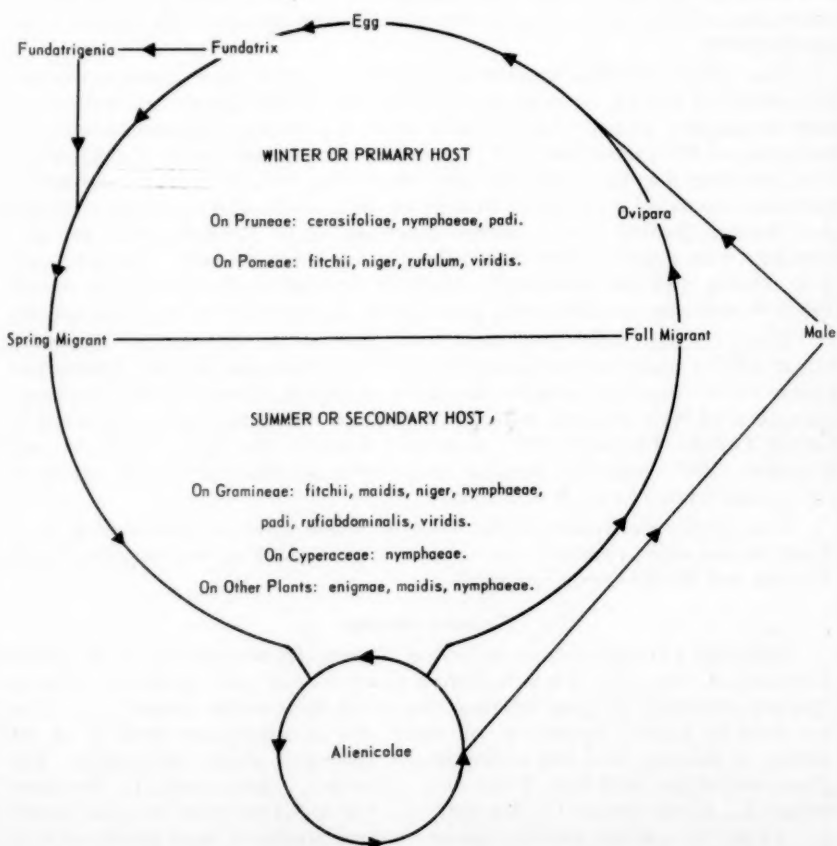


Fig. 1. Diagram of typical life cycle as exemplified by *Rhopalosiphum padi* (L.).

5. Fall Migrants: Apterous viviparous females that resemble spring migrants but are produced by the alienicolae.

6. Oviparae: Apterous. Produced on the winter host by fall migrants.

7. Males: Produced by alienicolae on the summer host in autumn.

Fig. 1 illustrates the typical life cycle which occurs normally in *Rhopalosiphum padi* (L.), *R. fitchii* (Sand.), *R. niger*, new species and *R. nymphaeae* (L.). A similar type probably occurs in *R. rufulum*, new species, but the alienicolae are unknown. *R. cerasifoliae* (Fitch) and *R. viridis*, new species, have essentially the same type of life cycle, but in the former fundatrigeniae are often produced throughout much of the summer, while in the latter this stage is never produced. *R. enigmae* Hottes and Frison is peculiar in that it spends its entire life on *Typha* sp. The life histories of *R. maidis* (Fitch) and *R. rufiabdominalis* (Sasaki) are unknown and only the alienicolous stages have been found in Canada, and the former apparently overwinter as alienicolae.

### Genus *Rhopalosiphum* Koch

1854 Koch, C. L. Die Pflanzenlaus. Nurnberg: 23.

Type Species: *Rhopalosiphum nymphaeae* (L.). Fixed by Gerstaecker, C. E. A. 1856 Arch. Naturgesch. 21: 272.

*Rhopalosiphum* has been loosely used to include *Aphis*-like forms in which the cornicles are slightly swollen. Börner (1952), whose concept is followed here, used this genus in a more restricted sense, and many of the species placed in *Rhopalosiphum* by early workers and workers in North America should be placed in other genera which are structurally and biologically different from *Rhopalosiphum*. The following key will serve to distinguish *Rhopalosiphum* as defined herein.

#### Key to *Rhopalosiphum*-like Genera

1. Without lateral abdominal tubercles ..... 2
- With lateral abdominal tubercles ..... 8
2. Dorsal setae short and slightly flabellate ..... *Coloradoa* Wilson
- Dorsal setae pointed or minutely capitate or blunt ..... 3
3. Dorsum of abdomen in apterae strongly sclerotic; cornicles with rounded, knoblike apices ..... *Cachryphora* Oestlund
- Dorsum of abdomen in apterae not sclerotic; cornicles not knobbed ..... 4
4. First tarsal segments normally with four setae ..... *Liosomaphis* Walker
- First tarsal segments with two or three setae ..... 5
5. First segments of hind tarsi with three setae ..... *Sitomyzus* H.R.L.
- First segments of hind tarsi with two setae ..... 6
6. Cornicles short and spiculose ..... *Lipaphis* Mordv.
- Cornicles long and smooth or nearly so ..... 7
7. Dorsum of head usually with weak spicules and alatae with a pigmented sclerotic patch on dorsum of abdomen ..... *Rhopalomyzus* Mordv.
- Dorsum of head without spicules and dorsum of abdomen in alate membranous ..... *Hyadaphis* Kirk.
8. Anterior pair of lateral abdominal tubercles situated on an imaginary line connecting the first two abdominal spiracles ..... 9
- Anterior pair of lateral abdominal tubercles situated distinctly dorsad of an imaginary line connecting the first two abdominal spiracles ..... 10
9. Hind wing in alatae with one oblique vein; lateral abdominal tubercles in apterae flat, with diameters that exceed those of spiracles ..... *Hysteronectura* Davis
- Hind wing in alatae with two oblique veins; lateral abdominal tubercles in apterae protuberant, with basal diameters about equal to those of spiracles ..... *R. cerasifoliae* (Fitch)
10. Cornicle distinctly swollen on apical half or at least strongly and abruptly attenuated just proximad to flange ..... 11
- Cornicle cylindrical and not abruptly attenuated proximad of flange ..... 12
11. Cornicle without a flange ..... *Hyalopterous* Koch
- Cornicle with a flange ..... *Rhopalosiphum* Koch

12. Media of forewing with one branch ..... 13  
 Media of forewing with two branches ..... *R. cerasifoliae* (Fitch)  
 13. Setae short and inconspicuous, usually not more than six longitudinal rows on dorsum ..... *Schizaphis* Börner  
 of abdomen ..... *Schizaphis* Börner  
 Setae long and pointed, usually with more than six longitudinal rows on dorsum ..... *Paraschizaphis* H.R.L.  
 of abdomen ..... *Paraschizaphis* H.R.L.

### Keys to Species of *Rhopalosiphum*

#### Key to *Fundatrices*

1. Antenna five-segmented ..... 2  
 Antenna six-segmented ..... *padi* (L.)  
 2. Dorsal setae of abdomen not minutely capitate ..... *niger*, new species  
 Dorsal setae of abdomen distinctly capitate except for those on segment VIII which  
 are sometimes pointed ..... 3  
 3. Cornicle dark coloured, slightly lighter at base ..... *rufulum*, new species  
 Cornicle dark only on apical half, usually at most only the tip dark .....  
*fitchii* (Sand.) and *viridis*, new species

#### Key to *Fundatrigeniae*

1. Cornicle cylindrical, rarely slightly expanded ..... *cerasifoliae* (Fitch)  
 Cornicle always expanded just proximad to apex ..... 2  
 2. Legs dark-coloured ..... 3  
 Apices of tibiae and whole of tarsi distinctly darker than middle part of tibiae ..... 4  
 3. Cornicle not much longer than base of sixth antennal segment ..... *niger*, new species  
 Cornicle much longer than base of sixth antennal segment ..... *nymphacae* (L.)  
 4. Light green, brown or almost black and strongly pulverulent; on *Prunus* sp. .... *padi* (L.)  
 Light green with three darker-green longitudinal stripes; not, or very weakly  
 pulverulent, on *Crataegus* spp. and *Malus* spp. .... *fitchii* (Sand.)

#### Key to *Alatoid Nymphs of Spring Migrants*

1. Wing pads lightly infuscated around edges and at apices ..... 2  
 Wing pads black ..... 3  
 2. Cornicles cylindrical ..... *cerasifoliae* (Fitch)  
 Cornicles swollen ..... *fitchii* (Sand.) and *viridis* new species  
 3. Cornicles 0.28 mm. or longer ..... *nymphacae* (L.)  
 Cornicles less than 0.28 mm. .... 4  
 4. Antennal segment III lighter than other segments ..... 5  
 Antennae almost completely dark, slightly lighter and the base of antennal segment  
 III ..... *niger* new species  
 5. Abdominal terga each with five or six setae ..... *padi* (L.)  
 Abdominal terga each with more than five or six setae ..... *rufulum* new species

#### Key to *Spring and Autumn Migrants*

1. Cornicle cylindrical or nearly so ..... *cerasifoliae* (Fitch)  
 Cornicle distinctly swollen ..... 2  
 2. Cornicle 0.3 mm. or longer ..... *nymphacae* (L.)  
 Cornicle shorter ..... 3  
 3. Unguis only slightly more than twice as long as the base of VI ..... *rufulum*, new species  
 Unguis longer than above ..... 4  
 4. Setae pointed on all abdominal terga ..... *niger*, new species  
 Setae normally minutely, but distinctly capitate or blunt on abdominal terga I-V or  
 VI ..... 5  
 5. Antennal segment III usually at least ten times as long as its greatest diameter. .... *padi* (L.)  
 Antennal segment III usually less than ten times as long as its greatest diameter. ....  
*fitchii* (Sand.) and *viridis*, new species

#### Key to *Apterous Alienicolae*

1. Antenna five-segmented, but segment III sometimes divided by a faint suture ..... 2  
 Antenna six-segmented, all segments distinct ..... 6  
 2. Setae on abdominal terga usually minutely, but distinctly capitate ..... *fitchii* (Sand.)  
 Setae on abdominal terga usually pointed, rarely capitate ..... 3

3. Setae on dorsal surfaces of hind tibiae equal to or shorter than apical diameters of tibiae; completely green in life and living on grasses just below the surface of the soil ..... *viridis*, new species  
 Setae on dorsal surfaces of hind tibiae longer than apical diameters of tibiae; brown, or green with reddish or black blotches around bases of cornicles when alive ..... 4
4. Setae on dorsal surfaces of pro- and meso-tibiae shorter and more spinelike than those on ventral surfaces ..... *niger*, new species  
 Setae on dorsal surfaces of pro- and meso-tibiae about the same length and shape as those on ventral surfaces ..... 5
5. Abdominal tergum VIII normally with four or more setae ..... *rufiabdominalis* (Sas.)  
 Abdominal tergum VIII normally with two setae ..... *parvae* (H. & F.)
6. Cornicle strongly swollen on apical half, not strongly spiculose, 0.3 mm. or longer ..... *nymphaeae* (L.)  
 Cornicle not strongly swollen, if 0.3 mm. or longer than strongly spiculose ..... 7
7. Cornicle strongly spiculose, 0.3 mm. or longer ..... *enigmae* H. & F.  
 Cornicle not strongly spiculose, normally not more than 0.3 mm. long ..... 8
8. Setae on dorsal surfaces of pro- and meso-tibiae shorter and more spinelike than those on ventral surfaces ..... *niger*, new species  
 Setae on dorsal surfaces of pro- and meso-tibiae about the same length and shape as those on ventral surfaces ..... 9
9. Dorsal abdominal setae normally minutely capitate or blunt, sometimes pointed, and those on tergum VIII rarely much longer than diameter of cornicle just proximad of flange ..... 10  
 Dorsal abdominal setae normally pointed and distinctly longer than diameter of cornicle just proximad of flange ..... 11
10. Antennal segments III-V inclusive rarely measuring more than 0.35 mm.; the longest setae on antennal segment III equal to or distinctly longer than basal diameter of segment; occurring on aerial parts of plants, and often with a relatively narrow, crimson band connecting cornicles ..... *fitchii* (Sand.)  
 Antennal segments III-V inclusive rarely less than 0.4 mm.; the longest setae on segment III rarely much more than half the basal diameter of segment; occurring on aerial parts of grasses, usually with large irregular orange blotches around cornicles when alive ..... *padi* (L.)
11. Cornicle cylindrical, not distinctly swollen or attenuated just proximad of flange ..... *cerasifoliae* (Fitch)  
 Cornicle distinctly swollen or abruptly attenuated just proximad of flange ..... 12
12. Abdominal tergum VIII normally with four or more setae ..... *rufiabdominalis* (Sas.)  
 Abdominal tergum VIII normally with only two, rarely three setae ..... 13
13. Unguis about two to 2½ times as long as the base of antennal VI ..... *maidis* (Fitch)  
 Unguis longer ..... *scirpifolii* G. & P.

### Key to Alate Alienicolae

1. Fourth antennal segment normally without sensoria ..... 2  
 Fourth antennal segment normally with sensoria ..... 3
2. Cornicle 0.28 mm. or longer and strongly swollen ..... *nymphaeae* (L.)  
 Cornicle less than 0.28 mm. and cylindrical or nearly so ..... *cerasifoliae* (Fitch)
3. Setae on abdominal tergum VIII normally minutely capitate, sometimes only blunt and usually not much longer than the apical diameters of cornicles ..... 4  
 Setae on abdominal tergum VIII pointed and normally distinctly longer than apical diameters of cornicles ..... 5
4. Antennal segment III + IV normally more than 0.4 mm., antennal setae very short and inconspicuous ..... *padi* (L.)  
 Antennal segment III + IV normally less than 0.4 mm. .... *fitchii* (Sand.)
5. Unguis two to 2½ times as long as the base of segment VI ..... *maidis* (Fitch)  
 Unguis longer ..... 6
6. Antenna five-segmented ..... 7  
 Antenna six-segmented ..... 8
7. Abdominal tergum VIII normally with four or more setae ..... *rufiabdominalis* (Sas.)  
 Abdominal tergum VIII normally with two, sometimes three setae ..... *viridis*, new species
8. Abdominal tergum VIII normally with four setae ..... *rufiabdominalis* (Sas.)  
 Abdominal tergum VIII normally with two setae ..... 9
9. Third antennal segment normally less than 0.3 mm. .... *viridis*, new species  
 Third antennal segment normally more than 0.3 mm. .... 10



10. Cornicles 0.28 mm. or longer ..... *enigmae* H. & F.  
 Cornicles less than 0.28 mm. .... *niger*, new species

### Key to Oviparae

1. Cornicles colourless ..... *cerasifoliae* (Fitch)  
 Cornicles black or fuscous at least on apical halves ..... 2  
 2. Cornicles black or fuscous only on apical halves ..... *padi* (L.)  
 Cornicles completely pigmented except sometimes at the extreme bases ..... 3  
 3. Brown when alive; cornicle about as long as antennal segment III ..... *nymphaeae* (L.)  
 Not brown when alive; cornicle shorter than antennal segment III ..... 4  
 4. Without reddish colour around bases of cornicles when alive ..... *viridis*, new species  
 With reddish colour around bases of cornicles when alive ..... 5  
 5. Mainly green when alive ..... *niger*, new species  
 Mainly yellow when alive ..... *fitchii* (Sand.)

### Key to Males

1. Antennal segments IV and V equal in length or nearly so, segment V about 0.3 mm. in length ..... *cerasifoliae* (Fitch)  
 Antennal segments IV and V not equal, V usually distinctly shorter, segment V less than 0.3 mm. in length ..... 2  
 2. Middle part of hind tibiae fuscous contrasting very little with the darker apical portion ..... *niger*, new species  
 Middle part of hind tibiae yellowish or pale and much lighter than fuscous or black apical portion ..... 3  
 3. Antennal segment III less than 0.4 mm. .... *fitchii* (Sand.) and *viridis*, new species  
 Antennal segment III 0.4 mm. or more ..... *padi* (L.)

### *Rhopalosiphum cerasifoliae* (Fitch)

1854 Fitch, A. New York Agric. Soc. Trans. 14: 835. *Aphis cerasifoliae*.

1931 Hottes, F. C., and Frison, T. H. Bull. Ill. Nat. Hist. Surv. 29: 186. *Aphis cerasifoliae*.

1952 Palmer, M. A. Thomas Say Foundation 5: 128. *Aphis cerasifoliae*.

1957 Börner, C. In Sorauer Handb. d. Pflanz. 5: 98. *Rhopalosiphum cerasifoliae*.

**Fundatrigenia.**—Colour in life: Light green with a median and lateral longitudinal darker stripes; apex of antennal segment III, antennal segments IV-VI, apical two rostral segments, apices of tibiae, tarsi, apices of cornicles dark; distinctly, but lightly pulverulent, especially on venter of abdomen. Colour in macerated specimens: Apices of antennal segments III and IV, antennal segments, V, VI, apical two rostral segments, apices of tibiae, tarsi and apices of cornicles dark brown to black; elsewhere lightly fuscous or colourless.

**Morphology:** Frontal tubercles well developed, each normally with a distinctly capitate seta that is shorter than the basal diameter of antennal segment III; median tubercle well developed with distinctly capitate seta on each side; setae on disc of head normally pointed, about one and a half times as long as the basal diameter of antennal segment III. Antennae six-segmented, shorter than body. Antennal setae normally blunt or distinctly capitate, the longest ones slightly longer than half the basal diameter of segment III. Lengths of antennal segments: III, 0.45-0.55 mm.; IV, 0.26-0.3 mm.; V, 0.275-0.3 mm.; VI, 0.125-0.15 mm. + 0.4-0.5 mm. Rostrum reaching to middle coxae; apical segment 0.11-0.125 mm. long, normally with two setae in addition to usual three pairs and minute basal pair. Prothorax with well developed lateral tubercles. Setae on dorsa of thoracic segments and abdominal terga I-IV or V pointed or minutely capitate, when pointed usually longer than basal diameter of antennal segment III, often shorter when capitate. Length of hind tibia 1.2-1.4 mm. Tibial setae shorter than apical diameters of tibiae, pointed and minutely capitate, the capitate ones on basal halves of dorsal surfaces. Setae on abdominal terga V or VI-VIII pointed, longer than diameter of cornicle just proximad of flange. Cornicle



roughly cylindrical, tapered toward apex, very slightly attenuated proximad of flange, with strongly spiculose imbrications; length 0.3-0.375 mm. Cauda elongate, triangular, normally not constricted at middle, strongly spiculose, with three or four setae on each side. Anal plate strongly spiculose with long slender pointed setae. Genital plate with spiculose imbrications and numerous, slender pointed setae. Dorsum of thorax and dorsa of abdominal terga I-VI faintly reticulate; abdominal terga VII and VIII, venter of abdomen, anterior surfaces of coxae and femora, and preapical rostral segments with spiculose imbrications; antennae and tarsi with smooth imbrications. Length 2.0-2.5 mm.

*Spring Migrant*.—Colour in life: Head, antennae except for extreme base of segment III, thorax, apices of tibiae, tarsi, abdominal intersegmental and lateral sclerites, pigmented bars on abdominal terga VII and VIII, and cornicle black; elsewhere green, yellow or light brown. Colour in macerated specimens: Head, antennae except extreme base of segment III, thorax, apices of tibiae, tarsi, abdominal intersegmental and lateral sclerites, and cornicles dark brown to black; elsewhere lightly fuscous to colourless.

*Morphology*: Antenna six-segmented, segment III with nine to 15 secondary sensoria arranged approximately in a straight line on posterior surface, other segments without secondary sensoria. Lengths of antennal segments: III, 0.3-0.5 mm.; IV, 0.225-0.35 mm.; V, 0.225-0.325 mm.; VI, 0.1-0.15 mm. + 0.35-0.475 mm. Dorsum of pterothorax normally with short, inconspicuous, pointed setae. Length of hind tibiae 1.1-1.25 mm. Abdominal terga VII and VIII usually with transverse, pigmented sclerotic bars. Cornicle 0.2-0.25 mm. Length 1.8-2.0 mm. Otherwise essentially as in fundatrigenia.

*Apterous Alienicola*.—Colour in life: Unknown. Colour in macerated specimens: Essentially as in fundatrigenia.

*Morphology*: Antennae six-segmented. Lengths of antennal segments: III, 0.375-0.4 mm.; IV, 0.225-0.3 mm.; V, 0.20-0.235 mm.; VI, 0.1-0.125 mm./0.4-0.475 mm. Length of apical rostral segment 0.08-0.1 mm. Length of hind tibiae 0.8-0.9 mm. Setae on abdominal terga I-VII capitate and shorter than diameter of cornicle just proximad to flange. Cornicle 0.225-0.25 mm. Length 2.0-2.5 mm. Otherwise essentially as in apterous fundatrigenia.

*Alate Alienicola*.—Colour in life: Not observed. Colour in macerated specimens: Essentially as in spring migrant.

*Morphology*: Antenna six-segmented. Segment III with 12-15 secondary sensoria, IV and V with none. Lengths of antennal segments: III, 0.45 mm.; IV, 0.275 mm.; V, 0.275 mm.; VI, 0.125 mm. + 0.5 mm. Apical rostral segment 0.1 mm. long. Hind tibiae 1.1 mm. long. Setae on abdominal terga I-V blunt, or minutely capitate and shorter than diameter of cornicle just proximad of flange; on terga VI-VIII longer, normally pointed. Cornicle 0.25 mm.; cylindrical. Length 2 mm. Otherwise as in spring migrant.

*Apterous Oviparous Female*.—Colour in life: Largely bright yellow, apical antennal segments, apical rostral segment and tarsi dark brown to black; cornicles, hind tibiae and cauda brown or light fuscous. Colour in macerated specimens: Two apical antennal segments, apical rostral segment, apex of cornicle, and tarsi dark brown; elsewhere light fuscous or colourless.

*Morphology*: Frontal tubercles well developed, each with a short, minutely capitate seta that is as long as half the basal diameter of antennal segment III; setae on disc of head the same size and shape as those on frontal tubercles. Antennae shorter than body, five-segmented, but segment III usually with a vestig-

ial suture about the middle. Antennal setae blunt or minutely capitate, the longest ones about the same length as those on disc of head. Length of antennal segments: III, 0.2-0.225 mm.; IV, 0.1-0.125 mm.; V, 0.075 mm. + 0.23 mm. Rostrum reaching to middle coxae; apical segment 0.075 mm. long, with two setae in addition to usual three apical pairs and minute basal pair. Prothoracic lateral tubercles present, minute and inconspicuous. Dorsal thoracic setae blunt or minutely capitate, about the same length as those on disc of head. Setae on legs mostly pointed, but usually there are some minutely capitate ones on dorsal surfaces of basal thirds of tibiae. Hind tibia 0.5 mm. long, with numerous round, flat sensoria. First tarsal segments of fore and middle legs normally each with three setae, those of hind legs normally with two. Setae on abdominal terga I-VII minutely capitate and shorter than diameter of cornicle just proximad of flange; setae on tergum VIII normally pointed, the longest ones equal to diameter of cornicle just proximad to flange. Lateral abdominal tubercles minute, present only on segments I and VII. Cornicle roughly cylindrical, slightly tapered toward apex, not abruptly attenuated just proximad of flange, with a few weakly spiculose imbrications; length 0.1 mm. Cauda short, rounded apically, slightly constricted at middle, with three or four slender, curved pointed setae on each side, coarsely spiculose. Anal plate coarsely spiculose with long, slender, pointed setae. Genital plate with spiculose imbrications and slender, pointed setae. Dorsum of thorax and dorsa of abdominal terga I-VI very finely reticulate. Abdominal terga VII and VIII, venter of abdomen, anterior surfaces of coxae and femora and preapical rostral segments with spiculose imbrications. Antennae and tarsi with smooth imbrications. Length up to 1.2 mm.

*Alate Male*.—Colour in life: Not observed. Colour in macerated specimens: Essentially as in spring migrant.

*Morphology*: Antenna shorter than body; 28 sensoria on segment III, 21 on segment IV, 20 on segment V. Lengths of antennal segments: III, 0.45 mm.; IV, 0.3 mm.; V, 0.3 mm.; VI, 0.125 mm. + 0.5 mm. Length of apical rostral segment 0.1 mm. Length of hind tibiae 0.975 mm. Length of cornicle 0.175 mm. Length 1.7 mm. Otherwise essentially as in spring migrant.

*Type Material*.—In the United States National Museum.

*Distribution*.—Probably occurs wherever *Prunus virginiana* L. and *P. pensylvanica* L. f. occur. Specimens examined from: MAN., on *Prunus virginiana* L., "pond reeds"; N.B., on *Prunus pensylvanica* L. f.; ONT., on *Prunus virginiana* L., *Prunus virginiana* var. *demissa* (Nutt. in T. & G.) Torr.

*Comments*.—The fundatrix of this species was not found but has been described by Palmer, 1952. Fundatrigeniae were found in longitudinally rolled leaves of *Prunus virginiana* and *Prunus virginiana* var. *demissa* where they often produce successive generations throughout the summer into early autumn. Attempts to get this species to feed on any species of grass or sedge were unsuccessful, but one male and alienicolae were collected from pond reeds in Manitoba. Aside from the fact that it sometimes produces successive generations throughout most of the summer on the winter host, the species is further peculiar in that the anterior abdominal tubercles are often situated directly on an imaginary line joining the first two abdominal spiracles, and in that the cornicles are cylindrical. Both of these features are characteristic of species of *Aphis* L. and related genera. Sexuales occur on the winter host during September. The species is most closely related to *R. padi*, the oviparae being very similar to those of *padi* with the exception of noted differences in colour.

Fall migrants of this species were not observed.

***Rhopalosiphum enigmae* Hottes and Frison**

1931 Hottes, F. C., and Frison, T. H. Bull. Ill. Nat. Hist. Surv. 29: 235. *Rhopalosiphum enigmae*.

1952 Palmer, M. A. Thomas Say Foundation 5: 215. *Rhopalosiphum enigmae*.

***Apterous Alienicola*.**—Colour in life: Largely dark brown, (Hottes and Frison, 1931, p. 235). Colour in macerated specimens: Head, antennae, rostrum, legs, intersegmental sclerites, cornicles, cauda, anal plate and usually a transverse pigmented bar or isolated spots on abdominal terga VI-VIII dark brown, elsewhere light fuscous or colourless.

**Morphology:** Frontal tubercles well developed, scabrous, each with a pointed seta that is about as long as the basal diameter of antennal segment III; setae on disc of head pointed, often twice as long as those on frontal tubercles. Antennae six-segmented, shorter than body. Setae on antennal segments I and II, usually  $1\frac{1}{2}$  times to twice as long as the basal diameter of segment III, the longest setae on III and IV about equal to the basal diameter of III. Setae on V and VI as long as or longer than basal diameter of III. Lengths of antennal segments: III, 0.3-0.35 mm.; IV, 0.175-0.225 mm.; V, 0.15-0.175 mm.; VI, 0.075-0.1 mm. + 0.45-0.5 mm. Rostrum reaching to middle coxae; apical segment 0.15 mm. long, with two setae in addition to usual three apical and minute basal pairs. Prothorax with well developed lateral tubercles. All dorsal thoracic setae pointed, about as long as those on disc of head. Length of hind tibiae 0.9-1.1 mm. Tibial setae all pointed, those on dorsal surfaces of fore and middle tibiae shorter than apical diameters of tibiae; other tibial setae distinctly longer than apical diameters of tibiae. All dorsal abdominal setae pointed, equal to or much longer than diameter of cornicle just proximad to flange. Cornicles roughly cylindrical, tapered toward apex and abruptly attenuated just proximad of flange; with numerous, strongly spiculose imbrications; length 0.325-0.375 mm. Cauda elongate, strongly conoposteriorly, with spiculose imbrications anteriorly, with long, pointed setae. Dorsum of thorax and abdomen strongly reticulate, except terga VII and VIII, which have spiculose imbrications. Venter of abdomen, coxae, anterior surfaces of femora and preapical rostral segments with strongly spiculose imbrications. Smooth imbrications on antennae and on tarsi. Length 2-2.25 mm.

***Alate Alienicola*.**—Colour in life: Not observed (see Hottes and Frison, 1931, p. 235). Colour in macerated specimens: Head, antennae, except for extreme base of segment III and the unguis, thorax, rostrum, femora, apices of tibiae and tarsi, lateral and intersegmental abdominal sclerites, cornicles and usually transverse bars on terga VII and VIII brown to black; elsewhere lightly fuscous or colourless.

**Morphology:** Lengths of antennal segments: III, 0.325-0.375 mm.; IV, 0.15-0.2 mm.; V, 0.125-0.17 mm.; VI, 0.1 mm. + 0.5-0.57 mm. Segment III with 7-12 sensoria, IV with 0-3. Length of apical rostral segment 0.15 mm. Wings hyaline; medius of forewings two-branched. Length of hind tibia 0.9-1.1 mm. Length of cornicle 0.3-0.325 mm. Length 2 mm. Otherwise essentially as apterous alienicola.

***Apterous Oviparous Female*.**—Colour in life: Dark brown, essentially as in apterous alienicola. Colour in macerated specimens: Essentially as in apterous alienicola.

**Morphology:** Frontal tubercles well developed, scabrous, each with a pointed seta that is longer than the basal diameter of antennal segment III; disc of head with pointed setae that are  $1\frac{1}{2}$  times to twice as long as those on frontal tubercles. Antennae five-segmented, segment III sometimes with a faint suture, shorter than

body. Antennal setae mostly longer than basal diameter of segment III, except for those on segment III which are often shorter than basal diameter. Lengths of antennal segments: III, 0.3-0.325 mm.; IV, 0.1-0.15 mm.; V, 0.075 mm. + 0.4-0.45 mm. Rostrum reaching hind coxae; apical segment 0.12-0.15 mm. long, with two setae in addition to usual three apical pairs and minute basal pair. Prothorax with well developed lateral tubercles. All setae on dorsum of thorax and abdomen equal to or longer than those on dorsum of head, most of them at least slightly longer than diameter of cornicle just proximad of flange. Length of hind tibia 0.75-0.8 mm. Hind tibiae swollen, with numerous, flat, round sensoria. Setae on dorsal surfaces of fore and middle tibiae and ventral surfaces of hind tibiae mostly shorter than apical diameters of respective tibiae; setae on ventral surfaces of fore and middle tibiae and dorsal surfaces of hind tibiae mostly longer than apical diameters. Normally three setae on each first tarsal segment of fore and middle legs, two on each of hind legs. Cornicle roughly cylindrical, with spiculate imbrications, abruptly attenuated proximad of flange; length 0.2-0.225 mm. Cauda normally short, somewhat triangular, slightly constricted near the middle, strongly spiculate, with two or three, slender, curved setae on each side. Anal plate strongly spiculate, with long slender, pointed setae. Genital plate with spiculate imbrications and numerous, slender, pointed setae. Venter of abdomen, terga VII and VIII, anterior surfaces of coxae and femora and preapical rostral segment with spiculate imbrications; smooth imbrications on antennae and tarsi; dorsum of thorax and abdominal terga I-VI faintly reticulate. Length 1.8 mm.

*Type Material*.—In Illinois State Natural History Collection.

*Distribution*.—Probably occurs wherever *Typha* spp. occur. Specimens examined from: ONT., on *Typha* sp.; MAN., on *Typha* sp.

*Comments*.—This rare species is peculiar in that it evidently spends the entire season on *Typha* spp. This is indicated by the fact that both alienicolae and sexuales have been taken in *Typha*. Only the oviparae and apterous alienicolae have as yet been collected in Canada. Notes on the alate alienicolae are from paratypes.

#### *Rhopalosiphum fitchii* (Sanderson)

- 1902 Sanderson, E. D. Ann. Rep. Del. Agric. Exp. Sta. 13: 137. *Aphis fitchii* (part).  
 1916 Theobald, F. V. Canad. Ent. 48: 235. *Siphocoryne avenae* (Misidentification).  
 1927 Theobald, F. V. Aphidae of Great Britain 21: 72, 206. *Rhopalosiphum prunifoliae* (part), *Aphis crataegella* (part).  
 1931 Hottes, F. C., and Frison, T. H. Bull. Ill. Nat. Hist. Surv. 29: 239. *Rhopalosiphum prunifoliae* (part).  
 1934 Hille Ris Lambers, D. Stylops 3: 26. *Rhopalosiphum crataegellum* (part).  
 1952 Palmer, M. A. Thomas Say Foundation 5: 215. *Rhopalosiphum fitchii* (part).  
 1957 Börner, C. In Sorauer, C. d. Pflanz. 5: 97. *Rhopalosiphum oxycanthae* (part).

*Fundatrix*.—Colour in life: Light to dark green with a darker green median and dorsolateral stripe; sometimes with very faint reddish blotches around the bases of the cornicles; without evident pulverulence; antennal segment V, apical rostral segment, apices of tibiae, tarsi and apices of cornicles dark brown to black; cauda, most of cornicles, other parts of legs and antennal segments I-V sordid green or yellow or light brown. Colour in macerated specimens: Antennal segment V, apical segment of rostrum, apices of tibiae, tarsi, apices of cornicles black; elsewhere colourless or light brown.

*Morphology*: Frontal tubercles poorly developed, each normally with one blunt or minutely capitate seta that is shorter than the basal diameter of antennal segment III; median tubercle developed, scabrous, with two setae of the same size

and shape as those on frontal tubercles. Setae on disc of head normally minutely capitate and shorter than basal diameter of antennal segment III. Antennae five-segmented; antennal setae shorter than basal diameter of segment III. Lengths of antennal segments: III, 0.25-0.35 mm.; IV, 0.075-0.1 mm.; V,  $0.075 + 0.15$  mm.-0.2 mm. Rostrum reaching to middle coxae; apical segment with two setae in addition to the usual three apical and minute basal pair; 0.12-0.13 mm. long. Prothorax with well developed lateral tubercles. Dorsal thoracic setae about the same size and shape as those on disc of head. Length of hind tibiae, 0.6-0.9 mm. Setae on appendages mostly capitate, but usually some setae near apices of femora and bases of tibiae blunt or minutely capitate; all tibial setae shorter than apical diameters of respective tibiae. Abdomen without pigmented sclerotic areas, including spiracular sclerites. Lateral abdominal tubercles normally present only on segments I and VII. Setae on all abdominal terga normally minutely capitate or blunt and shorter than diameters of cornicles just proximad of flanges. Cornicles nearly cylindrical, slightly tapered toward apex and usually abruptly attenuated just proximad to flange; 0.2-0.25 mm. long; with weakly spiculose imbrications. Cauda elongate, slightly constricted in the middle, with three or four slender, curved, pointed setae on each side; with spiculose imbrications basally and coarse spicules apically. Anal plate strongly spiculose; genital plate with spiculose imbrications, both plates with long, slender, pointed setae. Dorsum of abdomen and thorax faintly reticulate; spiculose imbrications on venter of abdomen, terga of abdominal segments VII and VIII, on anterior surfaces of femora and on preapical rostral segments; smooth imbrications on tarsi and antennae. Length 2.0-2.6 mm.

*Fundatrigenia*.—Colour in life: Light green, with a darker median and dorso-lateral stripe; usually with faint reddish blotches around bases of cornicles; most of abdomen, thorax and head lightly pulverulent; antennal segment VI, apical rostral segment, apices of tibiae, tarsi and apices of cornicles dark brown to black; cauda, most of cornicles, other parts of legs and antennal segments I-V sordid green, or yellow or light brown. Colour in macerated specimens: Antennal segment VI, apical segment of rostrum, apices of tibiae, tarsi, apices of cornicles black; elsewhere colourless or light brown.

Morphology: Frontal tubercles poorly developed, each with a slender pointed seta that is as long as basal diameter of antennal segment III. Setae on disc of head longer than basal diameter of antennal segment III, usually pointed anteriorly and minutely capitate posteriorly. Antennae six-segmented, shorter than body. Lengths of antennal segments: III, 0.3-0.4 mm.; IV, 0.175-0.25 mm.; V, 0.15-0.2 mm.; VI,  $0.075-0.12$  mm. +  $0.275-0.4$  mm. Rostrum reaching to second coxae; apical segment 0.13-0.15 mm. long, with two setae in addition to usual three apical pairs and minute basal pair. Prothorax with well developed lateral tubercles. Dorsal thoracic setae pointed, blunt or minutely capitate, about the same length as those on disc of head. Length of hind tibiae 0.85-1.11 mm. Setae on appendages mostly pointed, but usually some setae near apices of femora and bases of tibiae minutely capitate; all tibial setae shorter than apical diameters of tibiae. Abdomen without pigmented sclerotic areas, including spiracular sclerites. Lateral abdominal tubercles usually present on all segments. Abdominal terga I-V or VI with pointed and minutely capitate setae, that are usually more than half the basal diameter of antennal segment III, setae on segments VI-VII, and VIII always pointed, usually equal to or greater than the diameter of cornicle just proximad to flange; ventral abdominal setae all slender and pointed. Cornicles nearly cylindrical, attenuated just proximad to flange; length 0.275-0.325 mm.; with weakly spiculose imbrications. Cauda elongate, not



constricted in middle, with three or four slender, curved, pointed setae on each side; with spiculose imbrications basally, coarse spicules apically. Anal plate strongly spiculose; genital plate with spiculose imbrications; both plates with long, slender, curved, pointed setae. Dorsum of abdomen and thorax faintly reticulate; spiculose imbrications on venter of abdomen, on terga of abdominal segments VII and VIII, on anterior surface of femora, and on preapical rostral segments; smooth imbrications on tarsi and antennae. Length 2.0-2.6 mm.

*Alatoid Nymph*.—Colour in life: Similar to that of fundatrix, but dorsal stripes sometimes less conspicuous, usually more conspicuously pulverulent. Colour in macerated specimens: Wing pads lightly fuscous, otherwise essentially as in fundatrix.

**Morphology:** Average length of antennal segments: III, 0.2-0.285 mm.; IV, 0.12-0.2 mm.; V, 0.1-0.15 mm.; VI, 0.075-0.1 mm. + 0.275-0.325 mm. Length of hind tibiae 0.7-0.8 mm. Setae on disc of head, on antennae, and on abdominal tergum VIII pointed and slender. Length of cornicle 0.2-0.275 mm. Otherwise essentially as in fundatrix, except that articulation between antennal segments III and IV often poorly formed, but evident. Length 1.5-2.0 mm.

*Spring Migrant*.—Colour in life: Head, dorsum of prothorax, whole of pterothorax, apices of tibiae, tarsi, lateral and intersegmental sclerites black; femora and basal portion of tibiae brownish; antenna dark brown except for base of segment III which is lighter; dorsum of abdomen light green with a darker median dorsal and lateral stripe; venter of abdomen dark green, not pruinose. Colour in macerated specimens: Head, antennae except for base of segment III, dorsum of prothorax, pterothorax, femora, apices of tibiae, tarsi, lateral and intersegmental sclerites, cornicles, cauda, apical segment of rostrum, anal and genital plates dark brown; other regions colourless or slightly fuscous.

**Morphology:** Frontal tubercles evident, each with a slender, pointed seta that is usually slightly shorter than the basal diameter of antennal segment III; setae on disc of head usually pointed, about equal to basal diameter of antennal segment III. Antenna shorter than body, segment III with 12-24 sensoria, IV with 2-10, V, 0-4. Lengths of antennal segments: III, 0.325-0.425 mm.; IV, 0.21-0.275 mm.; V, 0.2-0.225 mm.; VI, 0.075-0.125 mm. + 0.31-0.375 mm. Setae on antennal segments usually pointed, sometimes slightly blunt, at least half the basal diameter of segment III. Rostrum extending to middle of mesothorax; apical segment 0.13-0.15 mm. long, with two setae in addition to usual three apical pairs and minute basal pair. Prothorax with well developed lateral tubercles; dorsal setae pointed, blunt or minutely capitate. Dorsum of pterothorax with minute, blunt or pointed setae; venter with a few slender, pointed ones. Membrane of wings hyaline, median of forewings two-branched. Length of hind tibiae 0.95-1.15 mm. Tibial setae shorter than apical diameters of tibiae, always pointed, longer and spinelike on apical halves. First tarsal segments of fore and middle legs each with three setae, those of hind legs each with two. Dorsum of abdomen membranous, except for pigmented intersegmental, sclerites and transverse, pigmented bars on segments VII and VIII. Setae on abdominal terga I-VI pointed, blunt, or minutely capitate and less than half the diameter of cornicles just proximad to flange; setae on tergum VII pointed, rarely less than three-fourths the diameter of cornicle just proximad to flange; setae on tergum VIII usually distinctly longer than diameter of cornicle just proximad to flange. Ventral abdominal setae long, slender, pointed, arranged in two irregular, transverse rows. Cornicles cylindrical, abruptly attenuated just proximad to flange; 0.2-0.275 mm. long. Cauda elongate, slightly constricted about the middle, with

two to four slender, curved, pointed setae on each side; coarsely spiculose. Anal plate coarsely spiculose. Genital plate with spiculose imbrications. Spiculose imbrications on venter of abdomen, on abdominal terga VII and VIII, on lateral sclerites, on anterior surfaces of coxae and on femora; smooth imbrications on tarsi, anterior surfaces of antennal segment III and on segments IV-VI. Length 2.0-2.5 mm.

*Apterous Alienicola*.—Colour in life: Body pale to dark green, with distinct pale reddish to crimson blotches at bases of cornicles; cornicles and appendages usually brownish, apices of tibiae, tarsi and antennae slightly darker. Colour in macerated specimens: Head, rostrum, antennal segments, legs, cornicles and cauda brown.

**Morphology:** Frontal tubercles well developed, each with a slender, curved, pointed seta that is longer than the basal diameter of antennal segment III; median tubercles with a long seta on each side, each of which is about twice as long as those on frontal tubercles; setae on disc of head about the same length as those on frontal tubercles. Antennae shorter than body, usually six-segmented but the division between segments III and IV often poorly formed and obscure. Lengths of antennal segments: III, 0.175-0.275 mm.; IV, 0.08-0.125 mm.; V, 0.075-0.10 mm.; VI, 0.05-0.075 mm. + 0.275-0.35 mm. Antennal setae pointed, usually as long as the basal diameter of segment III. Rostrum extending to middle coxae; apical segment 0.1-0.125 mm. long, with two setae in addition to usual three apical pairs and minute basal pair. Prothorax with well-developed lateral tubercles; all dorsal thoracic setae pointed and as long as those on disc of head. Tibial setae all erect, pointed, always shorter than apical diameters on hind legs. Length of hind tibia 0.5-0.65 mm. First tarsal segment of fore and middle legs each with three setae, those of hind legs each with two. Abdomen without sclerotic pigmented areas except for spiracular sclerites. Abdominal terga I-V normally with minutely capitate setae about the same length as those on disc of head, setae on terga VI and VII about twice as long as those on terga I-V and usually minutely capitate, setae on tergum VIII usually minutely capitate and usually not distinctly longer than diameter of cornicle just proximad to flange. Lateral abdominal tubercles sometimes present on all segments. Cornicle roughly cylindrical, usually strongly attenuated just proximad of flange, with spiculose imbrications; length 0.175-0.26 mm. Cauda elongate, slightly constricted near middle with two or three setae on each side; coarsely spiculose. Anal and genital plates strongly spiculose, with slender, curved, pointed, setae. Dorsum of thorax and of abdominal segments I-V with strong reticulations. Spiculose imbrications are present on venter of abdomen, dorsa of abdominal segments VII and VIII, anterior surfaces of femora and on preapical rostral segments. Smooth imbrications on tarsi and antennae. Length 1.5-1.7 mm.

*Alate Alienicola*.—Colour in life: Essentially as in spring migrant. Colour in macerated specimens: Essentially as in spring migrant.

**Morphology:** Antennae shorter than body, six-segmented; segment III with 9-15 sensoria, IV with 3-5, V with 0-2. Lengths of antennal segments: III, 0.25-0.275 mm.; IV, 0.1-0.15 mm.; V, 0.1-0.15 mm.; VI, 0.075 mm. + 0.35-0.4 mm. Length of hind tibiae 0.65-0.8 mm. Setae on abdominal terga I-V usually blunt or minutely capitate and less than the diameter of cornicle just proximad of flange; setae on terga VI-VIII blunt and usually more than half the diameter of cornicle just proximad to flange. Length of cornicle 0.15-0.75 mm. Length 1.4-1.5 mm. Otherwise essentially as in spring migrant.

*Fall Migrant.*—Colour in life: Essentially as in spring migrant. Colour in macerated specimens: Essentially as in spring migrant.

*Morphology:* Antennal segment III with 11-24 sensoria, IV with 3-8, V with 0-2. Lengths of antennal segments: III, 0.25-0.35 mm.; IV, 0.125-0.175 mm.; V, 0.13-0.175 mm.; VI, 0.07-0.1 mm. + 0.375-0.45 mm. Dorsal prothoracic setae pointed or blunt or minutely capitate. Length of hind tibiae 0.8-0.9 mm. Setae on abdominal terga I-V pointed, blunt or minutely capitate, those on segments VI, VII, and VIII usually pointed and equal to or greater than the diameter of cornicle just proximad of flange. Length of cornicle 0.175-0.225 mm. Length 1.6-1.75 mm. Otherwise essentially as in spring migrant.

*Apterous Oviparous Female.*—Colour in life: Thorax and abdomen bright yellow, with large bright orange or red blotches around the bases of cornicles; head brownish, legs brownish except apices of tibiae and tarsi which are black; antennae brownish except apical portions which are black; cornicles completely black; cauda brownish. Colour in macerated specimens: Thorax and abdomen colourless to light fuscous; head, antennae, legs, cornicles, cauda, anal and genital plates light to dark brown.

*Morphology:* Frontal tubercles well developed, somewhat scabrous, each with a slender curved seta that is nearly equal to basal diameter of antennal segment III; median tubercle well developed with a pointed seta on each side that is the same length as those on frontal tubercles; setae on disc of head usually pointed, sometimes blunt or minutely capitate, the same length as those on frontal tubercles. Antenna shorter than body, five-segmented, secondary sensoria absent. Lengths of antennal segments: III, 0.2-0.25 mm.; IV, 0.075-0.1 mm.; V, 0.06-0.075 mm. + 0.23-0.26 mm. All antennal setae nearly equal to the basal diameter of segment III. Rostrum reaching hind coxae; apical segment 0.1-0.12 mm. long, with two setae in addition to the usual three apical pairs and minute basal pair. All dorsal thoracic setae minutely capitate, about half the length of those on disc of head. Setae on legs mostly pointed, sometimes minutely capitate on dorsal surfaces of femora and basal portions of tibiae. Hind tibiae slightly swollen, with numerous, round, flat sensoria. Length of hind tibia 0.5-0.6 mm. First tarsal segments each with two or three setae. Abdomen without pigmented sclerotic areas. Abdominal terga I-V with minutely capitate setae that are shorter than those on disc of head; terga VI-VIII with pointed setae that are usually about twice as long as those on disc of head. Lateral abdominal tubercles minute or absent. Venter of abdomen with slender, pointed setae that are arranged in two irregular, transverse rows on each segment. Cornicle almost cylindrical, slightly attenuated proximad of flange, with weakly spiculose imbrications; 0.12-0.14 mm. long. Cauda short, rounded or triangular at apex; with two or three setae on each side; with spiculose imbrications basally and coarse spicules apically. Anal plate with coarse spicules; genital plate with spiculose imbrications; both plates with slender pointed setae. Spiculose imbrications on venter of abdomen, on dorsa of abdominal segments VII and VIII, on anterior surfaces of femora, and on preapical rostral segments; smooth imbrications on tarsi and on antennal segment. Dorsum of abdomen and thorax strongly reticulated. Length 1.5-1.6 mm.

*Alate Male.*—Colour in life and when macerated: Essentially as in spring and fall migrants, but abdomen paler, tending to be more yellowish.

*Morphology:* Antenna shorter than body; 11-30 sensoria on segment III, 3-8 on IV, 0-1 on V and usually one or two on base of VI. Lengths of antennal segments: III, 0.3-0.35 mm.; IV, 0.15-0.2 mm.; V, 0.15-0.18 mm.; VI, 0.075-0.1 mm.



+ 0.35-0.4 mm. Dorsum of each abdominal segment with an irregularly shaped, median dorsal, pigmented sclerotic patch. All dorsal abdominal setae pointed, those on segments V-VIII at least twice as long as those on segment I-IV. Length of hind tibia 0.75-0.9 mm. Length of cornicle 0.15-0.175 mm. Length 1.5-1.7 mm. Otherwise essentially as in spring and fall migrants.

*Type Material*.—In the United States National Museum.

*Distribution*.—Probably occurs wherever species of *Crataegus* occur. Specimens examined from: B.C., on *Malus* sp.; N.B., on *Malus* sp.; ONT., on *Crataegus* sp., *Malus* sp., *Cotoneaster* sp., *Avena sativa* L., *Triticum x aestivum* L., *Hordeum vulgare* L.

*Comments*.—The fundatrices, fundatrigeniae, and spring migrants were first described accurately by Sanderson (1902) and again by Palmer (1952). The alienicolae do not appear to have been described prior to the present study. This species is very closely related to *viridis* new species and can only be distinguished by the fact that fundatrigeniae are produced, by characters in the alienicolae and by the colour of the oviparae.

This species evidently overwinters only on *Crataegus* sp. and *Malus* sp., although structurally similar fundatrices also occur sparingly on *Cotoneaster* sp. Hatching occurs about the middle of April and spring migrants are produced from the middle of May to the middle of June. Early in the season only spring migrants are produced by the fundatrix but later, as the leaves grow larger fundatrigeniae are produced which in turn produce more spring migrants. On *Crataegus*, this species nearly always causes the leaves to become folded longitudinally, usually along the midrib. In general, the infested leaves look as though they have been prevented from developing properly, but even nearly full grown leaves become folded when attacked. Alienicolae were not discovered in the field, but in the laboratory they look and behave much the same as *R. padi*, and like *R. padi* feed mainly on the aerial parts of the grasses. Fall migrants and sexuales occur on the winter hosts from about the middle of September to the end of October.

Evidently a similar species occurs in Europe and fundatrices fundatrigeniae from England were examined in the course of this study that were inseparable from those in the type series of *R. fitchii*.

This species is easily confused with *R. padi* (L.) and *R. viridis*, new species. From the former it can be distinguished by the association with Pomeae instead of Prunae, the presence of five antennal segments in the fundatrix, the colour of fundatrix and fundatrigeniae, the slightly longer antennal hairs on the alienicolae, and the completely dark cornicles in the oviparae. From *viridis* it can be distinguished by the reddish colour around the bases of the cornicles in the alienicolae and oviparae, and the habit of feeding on the exposed or aerial parts of the grasses.

Fundatrices of this species that were collected on *Crataegus* sp. were found to reproduce readily on *Malus* sp., but not on *Sorbus* sp.

#### ***Rhopalosiphum maidis* (Fitch)**

1855 Fitch, A. New York Agric. Soc. Trans. 16: 551. *Aphis maidis*.

1931 Hottes, F. C., and Frison, T. H. Bull. Nat. Hist. Surv. 29: 205. *Aphis maidis*.

1952 Palmer, M. A. Thomas Say Foundation 5: 217. *Rhopalosiphum maidis*.

1953 Cottier, W. Bull. N.Z. Dep. Sci. Industr. Res. 106: 162. *Rhopalosiphum maidis*.

1954 Eastop, V. F. Proc. Roy. Ent. Soc. Lond. (A) 29: 84. *Rhopalosiphum maidis*.

1957 Börner, C. In Sorauer, Handb. d. Pflanz 5: 98. *Rhopalosiphum maidis*.

*Apterous Alienicola*.—Colour in life: Yellowish green to dark green usually with conspicuous dark blotches around bases of cornicles; head, antennae, legs, cornicles and cauda dark green, brown or black; slightly pulverulent. Colour in macerated specimens: Head, antennae, rostrum, legs, cauda, anal plate and genital plate, brown to dark brown; elsewhere slightly fuscous or colourless.

Morphology: Frontal tubercles well developed, scabrous, each with a long, slender, pointed seta that is normally as long as the basal diameter of antennal segment III; median tubercle well developed, with a pointed seta on each side which is as long as the setae on frontal tubercles; setae on disc of head slender, pointed, nearly the same length as those on frontal tubercles. Antenna shorter than body, five- or six-segmented; antennal setae normally pointed, those on segments I, II, V, VI, from two to three times as long as the basal diameter of segment III; setae on segment III-IV from  $1\frac{1}{2}$  times to twice the basal diameter of segment III. Lengths of antennal segments: III, 0.15-0.225 mm.; III and IV (when five-segmented), 0.3-0.35 mm.; IV, 0.07-0.15 mm.; V, 0.06-0.12 mm.; VI, 0.07-0.1 mm. + 0.15-0.225 mm. Rostrum reaching just beyond front coxae, apical segment 0.08-0.10 mm. long, with two setae in addition to the usual three apical setae and minute basal pair. Prothorax with well-developed lateral tubercles. Dorsal prothoracic setae normally pointed, sometimes blunt or even distinctly minutely capitate. Tibial setae erect, pointed, mostly shorter than apical diameter, but some of them much longer than apical diameters of tibiae. Length of hind tibia 0.5-0.7 mm. First tarsal segments of fore and middle legs each with three setae; normally only two setae on first tarsal segment of hind leg. Setae on abdominal terga normally pointed, sometimes blunt or distinctly capitate, all distinctly longer than diameter of cornicle just proximad of flange. Abdomen largely membranous except for pigmented spiracular sclerites. Cornicle sometimes roughly cylindrical, usually tapering toward attenuation just proximad of flange, often roughly elliptical with the base and attenuated part narrower than swollen middle portion; with strongly spiculose imbrications; length 0.12-0.15 mm. Cauda elongate, strongly spiculose, slightly constricted at middle, with two or three, slender curved setae on each side. Anal plate strongly spiculose posteriorly, with spiculose imbrications anteriorly; with long, slender, pointed setae. Dorsum of abdomen and thorax normally strongly reticulate. Venter of abdomen, abdominal terga VII and VIII, coxae, anterior surfaces of femora and preapical rostral segment, with strongly spiculose imbrications; smooth imbrications on antennae and tarsi. Length 1.3-2.0 mm.

*Alate Alienicola*.—Colour in life: Head, antennae, thorax, rostrum, legs, abdominal intersegmental and lateral sclerites, cauda and anal plate black; abdomen largely light to dark green; without obvious pulverulence. Colour in macerated specimens: Head, antennae, thorax, rostrum, legs, abdominal lateral and intersegmental sclerites, cornicles, cauda, anal plate, pigmented bars on abdominal terga VI, VII and VIII and often isolated pigmented spots on abdominal terga I-V, black to dark brown; elsewhere lightly fuscous or colourless.

Morphology: Frontal tubercles well developed, scabrous, each with a pointed seta that is equal to or longer than basal diameter of antennal segment III; setae on disc of head pointed, distinctly longer than basal diameter of antennal segment III. Antenna six-segmented, segment III with 12-23 sensoria, IV with 0-10, V with 0-4. Lengths of antennal segments: III, 0.24-0.35 mm.; IV, 0.1-0.2 mm.; V, 0.1-0.8 mm.; VI, 0.1 mm. + 0.15-0.25 mm. Setae on antennal segments normally pointed, those on segments I and II up to twice as long as the basal diameter of segment III, those on IV-VI usually about equal to basal diameter

of III, those on segment III normally shorter than basal diameter of III. Prothorax with well developed lateral tubercles. Setae on prothorax pointed, about the same length as those on disc of head; setae on dorsum of pterothorax pointed, about half as long as those on disc of head. Wings hyaline; media of forewings normally two-branched. Length of hind tibia 0.75-1.0 mm. Setae on tibia normally pointed and mostly shorter than apical diameter of tibia except for those on ventral surface which are sometimes equal to or distinctly longer than apical diameter of tibia. First tarsal segments of fore and middle tibia each normally with three setae, first segment of hind tarsus normally with two setae. Abdomen membranous except for intersegmental sclerites, lateral sclerites, pigmented sclerotic bars on terga VI-VIII, and sometimes pigmented spots on terga I-V. Setae on abdominal terga I-V normally pointed, equal to or slightly longer than diameter of cornicle just proximad to flange; setae on VI-VIII normally pointed, normally at least  $1\frac{1}{2}$  times the diameter of cornicle just proximad of flange. Ventral abdominal setae slender, pointed, arranged in two irregular, transverse rows on each segment. Cornicle usually elliptical, narrower at base and apical attenuated portion than in middle; normally with strongly spiculate imbrications; length 0.12-0.16 mm. Cauda elongate, normally constricted at middle, with two or three slender, curved, pointed setae on each side, strongly spiculate. Anal plate strongly spiculate, with long slender pointed setae. Genital plate with coarse spicules posteriorly, strongly spiculate imbrications anteriorly, with long pointed setae. Spiculate imbrications on venter of abdomen, on abdominal terga VI and VIII, on coxae, and on anterior surfaces of femora and preapical rostral segments; smooth imbrications on antennae and tarsi. Dorsum of abdomen weakly reticulate. Length 1.5-2.5 mm.

*Type Material*.—In the United States National Museum.

*Distribution*.—Virtually cosmopolitan. Specimens examined from: ALTA., on corn; MAN., on *Echinochloa crusgalli* (L.), Beauv. *Hordeum vulgare* L., *Zea mays* L.; N.B., on *gladiolus*, *Zea mays* L.; ONT., on *Setaria* sp., *Typha* sp., *Zea mays*, *Avena sativa* L., *Hordeum vulgare* L.; QUE., on *Avena sativa* L.

*Comments*.—The life history of this species is unknown. It appears on cereal crops early in the spring and remains in large numbers long after fall migrations of other species are well advanced. Sexual stages are unknown except for a single male recorded from Africa by Eastop (1954). In North America it is likely that this species overwinters as alienicolae on grasses.

#### *Rhopalosiphum niger*, new species

*Fundatrix*.—Colour in life: General ground colour of thorax and abdomen very dark green to blue-black; head, antennae, rostrum and legs dark brown to black, the apices of tibiae and tarsi only slightly darker; cornicles black; no pulverulence. Colour in macerated specimens: Head, antennal segments I, II, apical half of segment III, all of segment IV and V, rostrum, legs, cornicles, cauda, anal and genital plates dark brown; elsewhere slightly fuscous to colourless.

*Morphology*: Frontal tubercles poorly developed, slightly scabrous, without setae; median tubercle poorly developed, usually with a blunt or capitate seta on each side which is shorter than basal diameter of antennal segment III; setae on disc of head normally minutely capitate and shorter than basal diameter of antennal segment III. Antenna five-segmented, shorter than body. Lengths of antennal segments: III, 0.290-0.325 mm.; IV, 0.075-0.1 mm.; V, 0.075-0.85 mm. + 0.175-0.2 mm. Setae on antennal segments I and II blunt, equal to basal diameter of segment III; setae on basal half of segment III shorter than basal

diameter of segment III; usually about equal to basal diameter on apical half; setae on segments IV and V usually equal to basal diameter of segment III. Rostrum reaching to slightly beyond middle coxae; apical segment 0.125 mm. long with two setae in addition to the usual three apical pairs and minute basal pair. Prothorax with well developed lateral tubercles. Dorsal thoracic setae normally minutely capitate and about the same length as those on disc of head. Setae on legs mostly pointed, but usually a few blunt or minutely capitate ones on apices of femora, dorsal surfaces of fore and middle tibiae, and on basal halves of hind tibiae; mostly shorter than apical diameter of tibia except those on dorsal surface of apical halves of hind tibiae where they are erect, slender, pointed and equal to or slightly longer than the apical diameter. Length of hind tibia 0.8-0.9 mm. Except for small spiracular sclerites, the abdomen is without pigmented sclerotic areas. Lateral tubercles present or absent. Setae on abdominal terga I-VII minutely capitate, all shorter than diameter of cornicle just proximad to flange; setae on tergum VIII normally slender and pointed, equal to or longer than diameter of cornicle just proximad of flange. Ventral abdominal setae slender, pointed, arranged in two irregular rows on each segment. Cornicle nearly cylindrical, slightly tapered toward apex, abruptly attenuated just proximad of flange; with weakly spiculate imbrications; length 0.175-0.2 mm. Cauda elongate, sometimes distinctly constricted at middle, with two or three slender, pointed, curved setae on each side; strongly spiculate. Anal plate strongly spiculate, with long slender pointed setae. Genital plate strongly spiculate posteriorly, with spiculate imbrications anteriorly, with slender pointed setae. Dorsal integument of thorax and abdomen weakly reticulated. Spiculate imbrications on venter of abdomen, abdominal terga VII and VIII, anterior surfaces of femora and preapical rostral segments; smooth imbrications on antennae and tarsi. Length 2.0-2.5 mm.

*Fundatrigenia*.—Colour in life: Essentially as in fundatrix, but with reddish blotches around bases of cornicles which are usually partially obscured by the dark ground colour; usually conspicuous pulverulence on dorsum of head, on thorax and in dorsolateral, rectangular patches on abdominal terga I-V or VI. Colour in macerated specimens: Rostrum, antennal segments I, II, IV-VI, coxae, apices of femora, tibiae, tarsi, cornicles, cauda, anal and genital plate dark brown; elsewhere fuscous or colourless.

Morphology: Frontal tubercles well developed, each with a slender pointed seta that is equal to basal diameter of antennal segment III; setae on disc of head normally pointed and usually as long as those on frontal tubercles. Antenna shorter than body, six-segmented. Lengths of antennal segments: III, 0.275-0.4 mm.; IV, 0.2-0.25 mm.; V, 0.15-0.20 mm.; VI, 0.075-0.1 mm. + 0.300-0.375 mm. Setae on basal half of segment III shorter than basal diameter of III, other antennal setae equal to or longer than basal diameter of III. Rostrum reaching to middle coxae; apical segment 0.135-0.15 mm. long, with two setae in addition to usual three apical pairs and minute basal pair. Prothorax with well-developed lateral tubercles; dorsal prothoracic setae normally pointed and about as long as those on disc of head, setae on dorsum of meso- and meta-thoracic segments usually minutely capitate, shorter than those on disc of head. Setae on legs mostly pointed but a few blunt ones sometimes occur near apices of femora and bases of tibiae; all tibial setae normally shorter than apical diameters of tibiae, except those on dorsal surfaces of apical halves of hind tibiae where they are sometimes slightly longer than the apical diameters. Length of hind tibia 0.9-1.2 mm. First tarsal segments of fore and middle legs each with three setae, those of hind legs usually with two setae. Dorsum of abdomen usually with small interseg-

mental sclerites, otherwise without pigmented sclerotic areas except for spots at bases of each of the two setae on abdominal tergum VIII. Lateral tubercles normally present on only segment I and VII. Setae on abdominal terga I-IV normally minutely capitate, slightly less than half the diameter of cornicle just proximad to flange; setae on terga V normally pointed and slightly shorter than, or equal to diameter of cornicle just proximad of flange; setae on terga VI-VIII pointed and longer than diameter of cornicle just proximad of flange. Cornicle roughly cylindrical, tapered toward apex, strongly attenuated proximad to flange, with spiculate imbrications, length 0.2-0.275 mm. Cauda elongate, slightly constricted near middle, with three or four setae on each side; strongly spiculate. Anal plate strongly spiculate, with long, slender, pointed setae. Genital plate spiculate posteriorly, with spiculate imbrication anteriorly. Spiculate imbrications on venter of abdomen, abdominal terga VII and VIII, anterior surfaces of femora and on preapical rostral segments. Smooth imbrications on tarsi and antennae. Dorsum of thorax and abdomen without evident sculpturing. Length 1.7-2.2 mm.

*Alatoid Nymph.*—Colour in life: Essentially as in fundatrix, but lighter and with jet black wing pads. Colour in macerated specimens: Essentially as in fundatrigenia but with black wing pads.

Morphology: Frontal tubercles evident, each with a curved, pointed seta that is shorter than basal diameter of antennal segment III. Setae on disc of head pointed, equal to or longer than basal diameter of antennal segment III. Antenna shorter than body, six-segmented. Lengths of antennal segments: III, 0.2-0.25 mm.; IV, 0.15-0.2 mm.; V, 0.125-0.15 mm.; VI, 0.075-0.1 mm. + 0.3-0.325 mm. Dorsal thoracic setae short and obscure. Dorsal abdominal setae normally all pointed. Length of hind tibia 0.725-0.95 mm. Length of cornicle 0.175-0.225 mm. Length 2.00-2.5 mm. Otherwise essentially as in fundatrigenia.

*Spring Migrant.*—Colour in life: Essentially as in apterous fundatrigenia, except that sclerotic parts of head, thorax and abdomen are black. Colour in macerated specimens: Essentially as in fundatrigenia.

Morphology: Frontal tubercles each with a pointed seta that is equal to the basal diameter of antennal segment III; setae on disc of head pointed, as long as those on frontal tubercles. Antenna six-segmented; segment III with 16-28 secondary sensoria, IV with 8-15, V with 0-2. Lengths of antennal segments: III, 0.325-0.4 mm.; IV, 0.225 mm.; V, 0.15-0.175 mm.; VI, 0.075-0.725 mm. + 0.25-0.33 mm. Setae on antennal segments normally pointed, sometimes blunt, shorter than basal diameter of antennal segment III. Prothorax with well-developed lateral tubercles, dorsal setae pointed, as long as those on disc of head. Membrane of wings hyaline; media of forewing two-branched. Length of hind tibia 1.0-1.15 mm. Tibial setae shorter than apical diameter of tibiae, normally pointed, sometimes blunt. First tarsal segments of fore and middle legs each with three setae, two on each of those of hind legs. Abdomen membranous except for intersegmental sclerites, lateral sclerites, spiracular sclerites and pigmented sclerotic bars on terga VII and VIII. Setae on abdominal terga I-III pointed or capitate, when pointed, then longer than basal diameter of antennal segment III; setae on terga IV-VIII normally pointed and at least two-thirds the diameter of cornicle just proximad of flange. Ventral abdominal setae pointed, slender, arranged in two irregular rows on each segment. Cornicle roughly cylindrical, abruptly attenuated just proximad of flange; length 0.17-0.225 mm. Cauda elongate, distinctly constricted at middle, with two to four setae on each side; strongly spiculate. Anal plate coarsely spiculate, with long slender pointed



setae. Genital plate with coarse spicules posteriorly. Spiculose imbrications on venter of abdomen, on abdominal terga VI-VIII, on anterior surfaces of femora, on lateral abdominal sclerites and on preapical rostral segments; smooth imbrications on antennae and tarsi; dorsum of head, thorax and most of abdomen without evident sculpturing. Length 1.7-2.25 mm.

*Apterous Alienicola*.—Colour in life: Body green with conspicuous, irregularly shaped, reddish blotches around bases of cornicles; head, cornicles, antennae light to dark brown; legs dark brown, the apices of tibiae and tarsi not much darker than other parts of legs; not pulverulent. Colour in macerated specimens: Head, rostrum, antennal segments, legs, cornicles, and cauda dark brown; elsewhere lightly fuscous to colourless.

Morphology: Frontal tubercles well developed, scabrous, each with a pointed seta that is normally shorter than the basal diameter of antennal segment III; median tubercle well developed, with a slender, pointed seta on each side each of which is longer than the basal diameter of antennal segment III; setae on disc of head normally pointed, about the same size as those on each side of the frontal tubercles. Antenna five- or six-segmented, shorter than body. Lengths of antennal segments: III, 0.22-0.35 mm.; III and IV (when five-segmented), 0.26-0.35 mm.; IV, 0.15-0.2 mm.; V, 0.1-0.075 mm.; VI, 0.06-0.1 mm. + 0.275-0.325 mm. Antennal setae normally pointed or slightly blunt, the longest ones, which equal the basal diameter of segment III, occurring on apical half of segment III, and on segments IV-VI. Rostrum reaching to hind coxae; apical segment 0.1-0.13 mm. long with two setae in addition to the usual three apical pairs and minute basal pair. Prothorax with well-developed lateral tubercles; dorsal thoracic setae normally minutely capitate, usually shorter than the setae on disc of head. Tibial setae normally pointed, those on dorsal surfaces of fore and middle legs shorter than apical diameters of respective tibiae; those on hind tibiae and ventral surfaces of fore and middle legs mostly longer than apical diameters of respective tibiae. Length of hind tibia 0.7-1.0 mm. First tarsal segments of fore and middle legs each with three setae, those of hind legs each with two. Abdomen usually without pigmented sclerotic areas, but sometimes with pigmented areas on terga VII and VIII. Dorsal abdominal setae usually minutely capitate on terga I-III, and shorter than basal diameter of antennal segment III; setae on terga IV-VIII normally pointed, longer than the diameter of the cornicle just proximad to flange. Lateral abdominal tubercles normally present on segment I and VII, absent on other segments. Cornicle roughly cylindrical, slightly tapered toward apex; abruptly attenuated just proximad of flange; with spiculose imbrications; 0.2-0.225 mm. long. Cauda usually distinctly constricted near middle, with two or three setae on each side and sometimes a dorsal preapical one. Anal plate strongly spiculose, with long, slender, pointed setae. Genital plate with slender pointed setae, strongly spiculose anteriorly. Dorsum of thorax and abdomen usually strongly reticulate. Spiculose imbrications on venter of abdomen, on terga VII and VIII, on anterior surfaces of femora and on preapical rostral segments; smooth imbrications on antennae and tarsi. Length 1.3-2.2 mm.

*Alate Alienicola*.—Colour in life: Essentially as in spring migrant, but lighter and without evident reddish blotches around bases of cornicles. Colour in macerated specimens: Essentially as in spring migrant.

Morphology: Antenna shorter than body, usually six-segmented; segment III with 15-24 secondary sensoria; IV with 3-12, V with 0-4. Lengths of antennal segments: III, 0.225-0.35 mm.; IV, 0.125-0.2 mm.; V, 0.1-0.175 mm.; VI, 0.075-0.1 mm. + 0.35-0.4 mm. Setae on abdominal terga I-III normally

pointed, equal to diameter of cornicle just proximad to flange. Cornicle 0.175-0.2 mm. long. Length 1.5 mm. Otherwise essentially as in spring migrant.

*Fall Migrant.*—Colour in life and when macerated: Essentially as in spring migrant.

*Morphology:* Essentially as in spring migrant, but usually with small, mid-dorsal, sclerotic areas on each abdominal segment. Lengths of antennal segments: III, 0.375-0.45 mm.; IV, 0.225-0.3 mm.; V, 0.125-0.2 mm.; VI, 0.1 mm. + 0.5 mm. Antennal segment III with 17-35 sensoria, IV with 10-19, V with 2-9. Apical rostral segment 0.15 mm. long. Hind tibia 1-1.3 mm. Length 2-2.5 mm. Otherwise essentially as in spring migrant.

*Apterous Oviparous Female.*—Colour in life: Thorax and abdomen dark green or olive green, with distinct reddish blotches around bases of cornicles; head, antennae, rostrum and legs dark brown to black, the apices of tibiae and tarsi only slightly darker; cornicles black; no pulverulence. Colour in macerated specimens: Head, antennae, rostrum, legs, cornicles, cauda, anal and genital plates dark brown, the apices of tibiae and tarsi not noticeably darker.

*Morphology:* Frontal tubercles well developed, scabrous, each with a slender pointed seta that is slightly shorter than the basal diameter of antennal segment III; median tubercle well developed, with a pointed seta on each side, each of which is as long as those on frontal tubercles; setae on disc of head pointed or blunt, about equal to half the basal diameter of antennal segment III. Antenna shorter than body, five-segmented, secondary sensoria absent. Lengths of antennal segments: III, 0.2-0.22 mm.; V, 0.075-0.1 mm.; VI, 0.05-0.075 mm. + 0.225-0.25 mm. Antennal setae about equal to half the basal diameters of antennal segment III. Rostrum reaching to hind coxae; apical segment 0.1-0.125 mm. long, with two setae in addition to usual three apical pairs and minute basal pair. Setae on dorsum of thorax and abdominal segments I-V mostly blunt, shorter than those on disc of head; setae on terga VII and VIII pointed, longer than those on disc of head. Setae on legs pointed. Hind tibia slightly swollen, with numerous, round, flat sensoria. Length of hind tibia 0.5-0.55 mm. First tarsal segments each with two or three setae. Abdomen without sclerotic areas other than spiracular sclerites, anal and genital plates. Lateral abdominal tubercles absent. Venter of abdomen with pointed setae, arranged in two irregular rows on each segment. Cornicle cylindrical, slightly tapered toward apex, abruptly attenuated just proximad of flange, with weakly spiculose imbrications; 0.125 mm. long. Cauda short, rounded almost semicircular, with two setae on each side, strongly spiculose. Anal plate strongly spiculose, with long, slender, pointed setae. Genital plate wrinkled anteriorly, with a few spiculose imbrications posteriorly, with slender pointed setae. Spiculose imbrications on venter of abdomen, anterior surfaces of femora and preapical rostral segments; smooth imbrications on antennae and tarsi. Length 1.2-1.5 mm.

*Alate Male.*—Colour in life and when macerated: Essentially as in spring and fall migrants.

*Morphology:* Antenna shorter than body; 22-24 sensoria on III, 14-17 on IV, 12-14 on V, none on VI. Lengths of antennal segments: III, 0.275 mm.; IV, 0.15 mm.; V, 0.125 mm.; VI, 0.075 mm. + 0.375 mm. Dorsum of each abdominal segment with a small irregularly shaped pigmented, sclerotic patch. All dorsal abdominal setae pointed. Length of hind tibia 0.75 mm. Length 1.5 mm. Otherwise essentially as in spring and fall migrants.

*Type Material.*—No. 7031 in Canadian National Collection. Holotype: Fundatrix, Ottawa, Ont., May 24, 1958 (W. R. Richards), on *Crataegus* sp.

Paratypes: Three fundatrices (Same data as for holotype); 16 fundatrigeniae, Ottawa, Ont., May 24, June 9, 1958 (W. R. Richards); seven spring migrants, Ottawa, Ont., May 24, June 24, July 3, 1958 (W. R. Richards); eight apterous alienicolae, June 24, July 31, 1958 (W. R. Richards), reared on *Avena sativa* L.; ten apterous alienicolae, Marmora, Ont., Sept. 6, 15, 1952 (E. H. N. Smith), on *Zizania aquatica* L.; 10 alate alienicolae, Marmora, Ont., (same data as for apterous alienicolae); six fall migrants, Ottawa, Ont., Sept. 23, Oct. 1, 7, 8, 1958 (W. R. Richards), on *Crataegus* sp.; two oviparae, Oct. 8, 1958 (W. R. Richards), on *Crataegus* sp.; three males (same data as for oviparae).

*Distribution*.—Known only from type series as above.

*Comments*.—Confusion of live material is unlikely as the dark colour of the fundatrix and fundatrigenia and the dark legs in the alienicolae permits this species to be readily recognized. Mounted material may be confused with *R. scirpifolii*, but the differences in the lengths of the setae on the dorsal and ventral surfaces of the pro- and meso-tibiae in the alienicolae provide a ready means of distinguishing two species. Also, *scirpifolii* has only been associated with Pruneeae as a winter host whereas *niger* is only associated with *Crataegus* sp.

Although this species could be reared on *Avena sativa* L., its occurrence on *Zizania aquatica* in the field suggests that it may normally only be associated with grasses and sedges that grow in fairly moist situations.

#### *Rhopalosiphum nymphaeae* (L.)

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 1957 Börner, C. In Sorauer, Handb. d. Pflanz. 5: 95. *Rhopalosiphum nymphaeae*.

*Fundatrigenia*.—Colour in life: Dark brown, bases of third antennal segments and tibiae slightly lighter; venter of abdomen and thorax strongly pulverulent; lightly pulverulent on disc of head, dorsum of thorax and usually on each side of abdominal tergum I. Colour in macerated specimens: Head, antennae, rostrum, legs, intersegmental sclerites, spiracular sclerites, anal and genital plates, cornicles dark brown; usually with a well-defined pigmented sclerotic bar on abdominal tergum VIII and with small sclerotic spots around setae and lateral tubercles on abdominal segment VII; otherwise slightly fuscous or colourless.

*Morphology*. Frontal and median tubercles poorly developed, with pointed setae that are shorter than half the basal diameter of antennal segment III; setae on disc of head of the same size and shape as those on frontal tubercles. Antenna six-segmented, setae shorter than basal diameter of segment III and pointed, blunt or minutely capitate. Lengths of antennal segments: III, 0.325-0.425 mm.; IV, 0.25-0.275 mm.; V, 0.125-0.25 mm.; VI, 0.1-0.125 mm. + 0.325-0.4 mm. Rostrum reaching hind coxae; apical segment 0.15-0.175 mm. long with two setae in addition to usual three apical pairs and minute basal pair. Prothorax with well developed lateral tubercles. All dorsal thoracic setae pointed, the same size and shape as those on disc of head. Setae on appendages mostly pointed, sometimes



blunt or minutely capitate on dorsal surfaces of femora and basal third of tibiae; tibial setae mostly shorter than apical diameters except on apical halves of hind tibiae where they are sometimes longer than the apical diameters. Length of hind tibia 1.0-1.25 mm. First tarsal segments of fore and middle legs each with three setae, two on each first segment of hind tarsi. Intersegmental sclerites well developed on all thoracic and abdominal segments. Setae on abdominal terga I-VI mostly minutely capitate, about the same length as those on disc of head; setae on terga VII and VIII also minutely capitate, about twice as long as those on disc of head, shorter than half the diameter of cornicle just proximal to flange. Cornicle roughly cylindrical, tapered toward apex, slightly constricted near middle and abruptly attenuated just proximad of flange, 0.3-0.5 mm. long. Cauda elongate, slightly constricted near middle, with four or five setae on each side; strongly spiculose. Anal plate strongly spiculose, with slender pointed setae. Genital plate with spiculose imbrications and pointed setae. Spiculose imbrications on venter of abdomen, abdominal terga VII and VIII, anterior surface of coxae and femora, and on preapical rostral segments; smooth imbrications on antennae and tarsi. Dorsum of thorax and abdomen strongly reticulate. Length 2.0-2.7 mm.

*Alatoid Nymph.*—Colour in life: Essentially as in fundatrigenia, but with dark-brown to jet-black wing pads and normally a dorsolateral dash of white pulverulence on each of abdominal terga I-V or VI. Colour in macerated specimens: Essentially as in fundatrigenia but with dark-brown wing pads.

*Morphology:* Essentially as in fundatrigenia, but with wing pads and all dorso-abdominal setae normally pointed. Lengths of antennal segments: III, 0.275-0.325 mm.; IV, 0.2-0.25 mm.; V, 0.1-0.125 mm. + 0.3-0.35 mm. Length of hind tibiae 0.8 mm. Length of cornicle 0.325-0.35 mm. Length 2.0-2.5 mm.

*Spring Migrant.*—Colour in life: Essentially as in fundatrigenia, but basal part of tibiae lighter than apices. In macerated specimens: Similar to fundatrigenia, but with well-developed, dark-brown, lateral sclerites.

*Morphology:* Frontal tubercles poorly developed, each with a pointed seta that is slightly longer than half the basal diameter of antennal segment III; setae on disc of head pointed, as long as those on frontal tubercles. Antenna six-segmented; segment III with 17-28 sensoria, segments IV, V and VI with none. Lengths of antennal segments: III, 0.375-0.475 mm.; IV, 0.25-0.325 mm.; V, 0.225-0.35 mm.; VI, 0.125 mm. + 0.45-0.475 mm. Setae on antennal segments about as long as those on frontal tubercles and disc of head. Prothorax with well-developed lateral tubercles, dorsal setae normally pointed and as long as those on disc of head. Membrane of wings hyaline, media of forewing normally two-branched. Length of hind tibia 1.0-1.125 mm. Tibial setae normally pointed and usually shorter than apical diameters of tibiae; usually with a few setae on ventral surfaces of fore and middle tibiae and on dorsal and ventral surfaces of hind tibiae distinctly longer than apical diameters of tibiae. Abdomen membranous except for intersegmental sclerites, lateral sclerites, spiracular sclerites and pigmented, sclerotic bars on terga VII and VIII. Setae on abdominal terga I-VII pointed, the longest ones slightly longer than half the apical diameter of cornicle just proximad to flange; setae on tergum VIII pointed and normally slightly longer than diameter of cornicle just proximad of flange. Ventral setae pointed, slender, arranged in two irregular rows on each segment. Cornicle narrowed in middle, strongly swollen on apical half and abruptly attenuated just proximad to flange; with well-developed spiculose imbrications; length 0.3-0.375 mm. Cauda elongate, sometimes distinctly constricted in middle, strongly

spiculose, with three or four slender curved setae on each side. Anal plate strongly spiculose, with long, slender, pointed setae. Genital plate strongly spiculose posteriorly, with spiculose imbrications anteriorly, and with long, slender, pointed setae. Spiculose imbrications on venter of abdomen, on abdominal terga VII and VIII, on coxae, on anterior surfaces of femora and on preapical rostral segments; smooth imbrications on antennae and tarsi. Weak reticulations normally evident on dorsa of abdominal segments I-VI. Length 2.0-2.2 mm.

*Apterous Alienicola*.—Colour in life: Olive green to dark brown, without pulverulence or reddish coloration around the bases of cornicles. Colour in macerated specimens: Essentially as in fundatrigenia but lighter, intersegmental sclerites smaller.

Morphology: Frontal tubercles well developed, scabrous, each with a pointed seta that is only slightly shorter than basal diameter of antennal segment III; setae on disc of head pointed, the same length as those on frontal tubercles. Antenna six-segmented, antennal setae pointed, lengths about two-thirds the basal diameter of antennal segment III. Lengths of antennal segments: III, 0.25-0.45 mm.; IV, 0.175-0.25 mm.; V, 0.15-0.2 mm.; VI, 0.1-0.125 mm. + 0.375-0.45 mm. Rostrum reaching hind coxae; apical segment 0.175-0.2 mm. long, with two setae in addition to the usual three apical pairs and minute basal pair. Prothorax with well-developed lateral tubercles. All dorsal thoracic setae pointed, about the same length as the setae on disc of head. Setae on abdominal terga I-VII pointed, about as long as those on disc of head and about half the diameter of cornicle just proximad of flange; setae on tergum VIII pointed, normally slightly shorter than diameter of cornicle just proximad of flange. Length of hind tibia 0.95-1.05 mm. First tarsal segments of fore and middle legs each with three setae, two setae on each first segment of hind tarsi. Lateral abdominal tubercles normally present only on segments I and VII. Cornicle constricted in the middle, swollen on apical half and slightly but distinctly and abruptly attenuated just proximad of flange; length 0.28-0.4 mm.; with a few weak spiculose imbrications on basal half, smooth on apical half. Cauda elongate, constricted at middle, strongly spiculose, with two or three slender, curved, pointed setae on each side. Anal plate strongly spiculose, with long, slender, pointed setae. Genital plate with a few coarse spicules posteriorly, elsewhere with spiculose imbrications; with slender pointed setae. Dorsum of thorax and abdomen normally strongly reticulate. Venter of abdomen, abdominal terga VII and VIII, coxae, anterior surfaces of femora and preapical rostral segments with spiculose imbrications. Smooth imbrications on antennae and tarsi. Length 1.7-2.0 mm.

*Alate Alienicola*.—Colour in life: Essentially as in apterous alienicola. Colour in macerated specimens: Essentially as in apterous alienicola.

Morphology: Antennae shorter than body, six-segmented; segment III with 12-24 sensoria, IV, V and VI with none. Lengths of antennal segments: III, 0.275-0.375 mm.; IV, 0.2-0.275 mm.; V, 0.175-0.225 mm.; VI, 0.125-0.15 mm. + 0.425-0.5 mm. Hind tibiae 1.0-1.2 mm. long. Cornicles 0.3-0.4 mm. long. Length 1.5-2.0 mm. Otherwise essentially as in spring migrant.

*Fall Migrant*.—Colour in life and in macerated specimens: Essentially as in spring migrant.

Morphology: Antenna shorter than body, six-segmented; segment III with 20-26 sensoria, IV, V and VI normally with none. Lengths of antennal segments: III, 0.325-0.425 mm.; IV, 0.225-0.275 mm.; V, 0.2-0.25 mm.; VI, 0.125 mm. + 0.475-0.5 mm. Length of hind tibia 0.95-0.175. Length of apical rostral

segment 0.075-0.20 mm. Length of cornicle 0.3-0.385 mm. Otherwise essentially as in spring migrant.

*Apterous Oviparous Female.*—Colour in life: Body brown, antennae, legs and cornicles darker. Colour in macerated specimens: Antennal segments IV-VI tarsi and apices of fore and middle tibiae, whole of hind tibiae, apices of cornicles, cauda and anal plate dark brown; elsewhere lightly fuscous or colourless.

*Morphology:* Frontal tubercles poorly developed, each with a pointed seta that is about as long as half the basal diameter of antennal segment III; setae on disc of head about the same size and shape as those on frontal tubercles. Antenna five-segmented; antennal setae pointed, the longest ones equal to half the basal diameter of antennal segment III. Lengths of antennal segments: III, 0.325-0.425 mm.; IV, 0.225-0.275 mm.; V, 0.2-0.25 mm. + 0.225-0.275 mm. Prothorax with well developed lateral tubercles; all dorsal thoracic setae pointed, about the same length as those on disc of head. Setae on legs pointed, normally shorter than apical diameters of tibiae. Hind tibia swollen, with numerous, round flat sensoria. Length of hind tibia 0.5 mm. First tarsal segments each normally with two setae; sometimes three on fore and middle legs. Lateral abdominal tubercles absent. Dorsal abdominal setae short, on segments I-V slightly longer than those on disc of head and thorax; on segments VI-VIII slightly longer, usually at least half the diameter of cornicle just proximad to flange. Venter of abdomen with pointed setae arranged in two irregular rows on each segment. Cornicle slightly narrowed in middle, distinctly swollen on apical half, slightly, but abruptly attenuated just proximad to flange; virtually smooth but sometimes with a few weakly spiculate imbrications on basal half; length 0.2-0.225 mm. Cauda elongate, triangular, apex normally pointed, strongly spiculate, with three or four, pointed, curved setae on each side. Anal plate strongly spiculate posteriorly, with spiculate imbrications anteriorly; with slender pointed setae. Genital plate with a few strong spicules posteriorly, with spiculate imbrications anteriorly, with slender pointed setae. Dorsum of abdomen and thorax with weak reticulations which are often not readily visible. Spiculate imbrications on venter of abdomen, abdominal terga VII and VIII, coxae, anterior surfaces of femora and preapical rostral segments; smooth imbrications on antennae and tarsi. Length 1.2-1.3 mm.

*Type Material.*—Evidently does not exist.

*Distribution.*—Virtually cosmopolitan. Specimens examined from: B.C., on *Nuphar* sp., *Prunus persica* Sieb. and Zucc.; MAN., on *Lemma* sp.; ONT., on *Zizania aquatica* L., *Scirpus* sp., *Pontederia* sp., *Nuphar* sp., *Prunus nigra* Ait., *Potamogeton nodosus* Poir., *Sorbus* sp.

*Comments.*—The relatively long, distinctly expanded cornicles readily distinguish this species from others in the group. Its habit of feeding on almost any form of emergent or floating vegetation also provides ready means for identification.

Although this species is one of the most common and widespread, populations on the winter host are rarely found. During this study only a single population consisting of a few fundatrigeniae was found. This species can evidently only overwinter successfully on *Prunus* sp., but oviparae are commonly produced on *Sorbus* sp. Males were not observed.

#### *Rhopalosiphum padi* (L.)

1758 Linnaeus, C. Systema Naturae p. 451. *Aphis padi*.

1854 Fitch, A. New York Agric. Soc. Trans. 14: 826. *Aphis prunifoliae*.

1917 Patch, E. Bull. Me. Agric. Exp. Sta. 267: 293. *Aphis pseudoavenae*.

- 1926 Theobald, F. V. Aphidae of Great Britain 2: 72. *Rhopalosiphum prunifoliae* (part).  
1931 Hottes, F. C., and Frison, T. H. Bull. Ill. Nat. Hist. Surv. 29: 239. *Rhopalosiphum prunifoliae* (part).  
1947 Rogerson, J. P. Bull. Ent. Res. 38: 157. *Rhopalosiphum padi*.  
1952 Palmer, M. A. Thomas Say Foundation 5: 215. *Rhopalosiphum fitchii* (part).  
1953 Cottier, W. Bull. N.Z. Dep. Sci. and Industr. Res. 106: 155. *Rhopalosiphum padi*.  
1957 Börner, C. In Sorauer, Handb. d. Pflanz. 5: 95. *Rhopalosiphum padi*.  
1957 Doncaster, J. P. Bull. Zool. Nom. 13: 248. *Rhopalosiphum padi*.

*Fundatrix*.—Colour in life: Thorax and abdomen pale green, with faint reddish blotches around the bases of cornicles; cornicles fuscous on apical halves, black at apices; legs light brownish except apices of tibiae and tarsi which are black; antenna pale except apical halves of segment V and all of segment VI which are black; cauda and rostrum dark; without distinct pruinosity. Colour in macerated material: Body light brown, rostrum, cauda, anal and genital plates, apices of tibiae and tarsi and apices of cornicles dark.

*Morphology*.—Frontal tubercles poorly developed; setae on disc of head minutely capitate, rarely longer than 0.015 mm. Antenna shorter than body; primary sensoria on segments V and VI with strongly ciliated margins. Lengths of antennal segments: III, 0.25-0.32 mm.; IV, 0.15-0.175 mm.; V, 0.12-0.15 mm.; VI, 0.1-0.15 mm. + 0.175-0.2 mm. Setae on antennal segments I and II blunt or distinctly capitate, equal to half basal diameter of segment III; setae on segments III-VI blunt, shorter than half basal diameter of III, only sometimes more than 0.015 mm. in length. Rostrum reaching slightly beyond anterior margins of middle coxae; with two setae in addition to the usual three apical pairs and minute basal pair; 0.09-0.125 mm. long. Prothorax with well-developed lateral tubercles. All dorsal thoracic setae distinctly but minutely capitate, about the same length as those on disc of head. Length of hind tibia 0.8-0.9 mm. Setae on appendages usually slender, pointed, sometimes blunt, most of them shorter than apical diameters of tibiae, except for those on dorsal surface of apical fifth of hind tibia, where they are long, erect, pointed, curved, equal to or longer than the apical diameter of tibia. Except for small spiracular sclerites, abdomen without pigmented sclerotic areas; lateral tubercles present on segments I and VII, usually absent on other segments. Setae on dorsum of abdomen usually minutely and distinctly capitate, those on segments I-VII usually not more than 0.015 mm., those on segment VIII longer, equal to, or longer than basal diameters of antennal segment III; ventral setae longer than dorsal setae, slender, pointed, arranged in two irregular, transverse rows. Cornicle nearly cylindrical, narrowed toward apex, with well-developed flange and scattered, smooth imbrications, length 0.175-0.2 mm. Cauda elongate, triangular, not constricted at middle; strongly spiculate, with three to five slender, curved, pointed setae on each side. Anal and genital plates strongly spiculate, with slender, pointed setae. Integument smooth except for spiculate imbrications on venter of abdomen and on terga of abdominal segments VII and VIII; smooth imbrications, on tarsi, on anterior surface of antennal segment III and on whole of segments IV-VII. Length 2.5-2.7 mm.

*Fundatrigenia*.—Colour in life: Light to very dark green, sometimes brown, often almost black, usually covered with a thick layer of flocculent waxy material; with reddish blotches at bases of cornicles, but these often obscured by the waxy secretion and dark colour; legs brownish, apices of tibiae and tarsi darker. Colour in macerated material: Body and antennal segment III slightly infuscated; head, rostrum, antennal segments IV-VI, coxae, apices of tibiae, tarsi, cornicles, cauda, anal plate, genital plate, intersegmental and spiracular plates dark brown;

femora, basal four-fifths of tibiae, trochanters and antennal segment I and II light brown.

**Morphology:** Frontal tubercles developed, each with a slender, pointed seta that is as long as basal diameter of antennal segment III; disc of head with pointed or capitate setae, when pointed then usually equal to or longer than, basal diameter of antennal segment III. Antenna shorter than body. Lengths of antennal segments: III, 0.35-0.45 mm.; IV, 0.2-0.275 mm.; V, 0.175-0.225 mm.; VI, 0.1-0.13 mm. + 0.35-0.375 mm. Setae on antennal segments, I, II and V blunt to slightly capitate, sometimes pointed, up to three-fourths as long as basal diameter of III; on segments III, IV and VI setae are minutely capitate, sometimes blunt or pointed, usually less than half basal diameter of III. Rostrum extending to middle coxae, with two setae in addition to three apical pairs and minute basal pair; apical segment 0.12-0.125 mm. long. Prothorax with well developed lateral tubercles; dorsal thoracic setae, short, minutely capitate. Length of hind tibia 0.9-1.1 mm. Setae on appendages usually pointed, sometimes blunt or minutely capitate; tibial setae mostly shorter than apical diameters of tibiae, except those on dorsum of apical surface of hind tibia where they are usually equal to or longer than the apical diameters. First tarsal segments of fore and middle legs each with three setae, two on each tarsus of hind legs. Dorsum of abdomen without pigmented sclerotic areas except intersegmental sclerites. Lateral tubercles sometimes present on all segments except VIII. Setae on abdominal terga I-VI usually distinctly capitate, shorter than basal diameter of antennal segment III; setae on terga VII and VIII pointed or capitate usually longer than basal diameter of antennal segment III; ventral and pleural setae slender, pointed. Cornicle roughly cylindrical, abruptly constricted proximad of well-developed flange; with almost smooth imbrications; length 0.2-0.275 mm. Cauda elongate, not constricted, strongly spiculose, with two or three slender, curved, pointed setae on each side. Anal and genital plates strongly spiculose, with long, slender, pointed setae. Integument with spiculose imbrications on venter of abdomen, abdominal terga VII and VIII, anterior surfaces of femora and all preapical segments of rostrum; smooth imbrications on tarsi, antennal segments IV-VI and anterior surface of segment III. Length 2.2-2.45 mm.

**Alatoid Nymph.**—Colour in life: Usually olive green to light green, sometimes brownish; legs brown, darker at apices of femora, apices of tibiae and whole of tarsi; antennae brown, segments IV-VI darker; wing pads completely dark brown to black; cornicles dark brown to black, with faint reddish blotches around bases; conspicuous waxy secretion on dorsum of head, on whole of venter of abdomen and on transversely elongate patches on each side of abdominal terga I-V or VI. Colour in macerated material: Head, antennal segments I, II, IV-VI, rostral segments III and IV, wing pads, tarsi, and apices of tibiae, cornicles, cauda and anal plate dark brown; antennal segment III, coxae, femora and basal four-fifths of tibiae lighter; elsewhere lightly infuscated.

**Morphology:** Lengths of antennal segments: III, 0.325-0.35 mm.; IV, 0.2-0.225 mm.; V, 0.15-0.18 mm.; VI, 0.075-0.1 mm. + 0.1-0.325 mm. Setae on antennal segments V and base of VI longer than basal diameter of III. Integument faintly reticulated. Length 1.5-1.7 mm. Otherwise essentially as in fundatrigenia.

**Spring Migrant.**—Colour in life: Head, dorsum of prothorax, whole of prothorax, apices of tibiae, tarsi, lateral and intersegmental sclerites black; femora and basal portion of tibiae brownish; antenna dark brown except for base of segment III which is lighter; dorsum of abdomen dark green, without distinct



reddish colour at bases of cornicles, venter of abdomen dark green to black, lightly pruinose. Colour in macerated material: Head, antenna except for base of III, dorsum of prothorax, pterothorax, femora, apices of tibiae, tarsi, lateral and intersegmental sclerites, cornicles, cauda, apical segment of rostrum, anal and genital plates dark brown; other regions lighter or slightly fuscous.

**Morphology:** Frontal tubercles evident, each with a slender pointed seta that is shorter than basal diameter of antennal segment III; setae on disc of head usually pointed, sometimes blunt, equal to or longer than basal diameter of antennal segment III. Antenna shorter than body; segment III with 12-24 secondary sensoria on posterior surface; IV with 1-6, V with 0-5, VI without secondary sensoria. Length of antennal segments: III, 0.4-0.5 mm.; IV, 0.25-0.325 mm.; V, 0.15-0.2 mm.; VI, 0.075-0.08 mm. + 0.36-0.5 mm. Setae on antennal segments usually blunt, rarely more than half the basal diameter of III. Rostrum extending to near the middle of the mesothorax; apical segment with two setae in addition to usual three apical pairs and minute basal pair. Prothorax with well developed lateral tubercles; dorsal setae pointed or slightly capitate, usually equal to half the basal diameter of antennal III. Dorsum of pterothorax with short blunt setae, venter with a few slender pointed ones. Membrane of wings hyaline; media of forewing two-branched. Length of hind tibia 1.0-1.1 mm. Tibial setae all shorter than apical diameters of tibiae, longest and most spinelike on apical halves, sometimes blunt or minutely capitate on basal fourths. First tarsal segments of fore and middle legs each with three setae, those of hind legs normally with two each. Dorsum of abdomen membranous except for intersegmental sclerites, usually a few small pigmented areas on tergum VI and narrow, pigmented patches on VII and VIII. Setae on abdominal terga I-VI shorter than diameters of cornicles just proximad of flange, normally distinctly capitate; setae on tergum VII capitate or pointed, usually equal to or longer than diameter of cornicle just proximad of flange; setae on tergum VIII usually slender, pointed and much longer than diameter of cornicle just proximad of flange. Ventral abdominal setae slender, pointed, arranged in two irregular, transverse rows on each segment. Cornicle nearly cylindrical; abruptly attenuated just proximad of flange; with minutely spiculose imbrications; length 0.2-0.25 mm. Cauda elongate, slightly constricted near middle, with two or four slender, curved setae on each side; coarsely spiculose. Anal plate coarsely spiculose. Genital plate with heavy, spiculose imbrications. Spiculose imbrications on venter of abdomen, on abdominal terga VI, VII and VIII, on lateral sclerites, on anterior surfaces of coxae and femora. Smooth imbrications on tarsi, on anterior surface of third antennal segment and on segments IV-VI. Length 2.30-2.50 mm.

*Apterous Alienicola.*—Colour in life: Body light to dark green, with large conspicuous, irregularly-shaped, reddish blotches at bases of cornicles; apices of tibiae, tarsi, antennal segments IV-VI dark brown, light brown elsewhere; normally without waxy secretions. Colour in macerated specimens: Essentially as in fundatrigenia.

**Morphology:** Setae on frontal tubercles, disc of head, antennal segments, thoracic and abdominal terga I-VI, short, usually distinctly capitate, none of them longer than the basal diameter of antennal segment III. Setae on abdominal terga VII and VIII distinctly capitate, equal to or slightly shorter than the diameter of cornicle just proximad to flange. Lengths of antennal segments: III, 0.225-0.35 mm.; IV, 0.125-0.25 mm.; V, 0.1-0.175 mm.; VI, 0.06-0.1 mm. + 0.36-0.4 mm. Setae on legs blunt or pointed, hind tibia often with a few setae on ventral surface near middle that are noticeably longer than others. Length of hind tibia

0.60-0.675 mm. Integument with coarse reticulations. Otherwise essentially as in fundatrigenia. Length 1.2-2.5 mm.

*Alate Alienicola*.—Colour in life: Essentially as in spring migrant but usually lighter. Colour in macerated specimens: Essentially as in spring migrant.

Morphology: Setae on dorsum of abdominal segment VIII often distinctly minutely capitate, sometimes blunt, rarely slightly longer than diameter of cornicle just proximad of flange. Antennal segment III with 10-22 secondary sensoria, IV with 0-6, V with 0-1. Lengths of antennal segments: III, 0.28-0.325 mm.; IV, 0.125-0.175 mm.; V, 0.125-0.14 mm.; VI, 0.06-0.1 mm. + 0.3-0.45 mm. Length of hind tibia 0.6-0.85 mm. Length 1.25-1.75 mm. Otherwise as in spring migrant.

*Fall Migrant*.—Colour in life: Essentially as in spring migrant. Colour in macerated specimens: Essentially as in spring migrant.

Morphology: Antenna shorter than body; segment III with 13-24 secondary sensoria, IV with 2-4, V with 0-3, VI with none. Lengths of antennal segments: III, 0.3-0.48 mm.; IV, 0.175-0.25 mm.; V, 0.16-0.2 mm.; 0.075-0.1 mm. + 0.46-0.51 mm. Setae on antennal segments usually pointed, sometimes blunt, rarely more than half the basal diameter of segment III. Length of apical rostral segment 0.1-0.15 mm. Length of hind tibia 0.9-1.1 mm. Setae on abdominal terga I-V mostly minutely capitate, about the same length as those that occur on disc of head; setae on terga VI and VII usually pointed, sometimes blunt or distinctly capitate, about as long as diameter of cornicle just proximad of flange; setae on tergum VIII pointed, usually longer than diameter of cornicle just proximad of flange. Length of cornicle 0.225-0.275 mm. Length 2.0-2.6 mm. Otherwise essentially as in spring migrant.

*Apterous Oviparous Female*.—Colour in life: Body light yellow, with a bright orange or red blotch around the base of each cornicle; head, rostrum, cauda and anal plate brownish; antennal segments I-III nearly colourless, segments IV-VI black; legs brownish except apices of tibiae and tarsi which are black; cornicles yellowish on basal halves, black on apical halves. Colour in macerated specimens: Thorax, abdomen, antennal segment III, coxae, trochanters and femora, colourless to slightly fuscous; head, antennal segments I and II, basal four-fifths of tibiae, basal halves of cornicles and anal plate light brown; antennal segments IV-VI; apical rostral segments, apices of tibiae, tarsi, apices of cornicles and cauda dark brown.

Morphology: Frontal tubercles well developed, each with a short, blunt or minutely capitate seta that is equal to half the basal diameter of antennal segment III; disc of head with short capitate setae that are about as long as those on frontal tubercles. Antenna shorter than body, five-segmented, but segment III sometimes with a faint indication of a subsegment; secondary sensoria absent; all antennal setae minutely capitate, about as long as setae on disc of head. Lengths of antennal segments: III, 0.275-0.325 mm.; V, 0.1-0.125 mm.; VI, 0.075 mm. + 0.275-0.325 mm. Rostrum reaching slightly beyond middle coxae, with two setae in addition to the usual three apical pairs and minute, basal pair; apical segment 0.05 mm. long. Prothoracic lateral tubercles minute, inconspicuous or absent. All dorsal thoracic setae blunt to minutely capitate and about as long as those on disc of head. Pointed setae on coxae, trochanters, anterior surfaces of femora, apical four-fifths of tibiae and on tarsi; blunt or minutely capitate setae elsewhere on legs. Hind tibia slightly swollen, with many round, flat sensoria. Length of hind tibia 0.55-0.62 mm. First tarsal segments of fore and middle legs each with three setae, two on hind tarsus. Abdomen without pigmented,

sclerotic areas. Abdominal terga I-VII with capitate setae that are shorter than the diameter of cornicle just proximad of flange; tergum VIII with six pointed setae of which the longest exceed the diameter of cornicle just proximad of flange. Lateral abdominal tubercles minute or absent. Venter of abdomen with slender pointed setae that are arranged in two irregular transverse rows. Cornicle almost cylindrical, slightly, but abruptly attenuated just proximad of flange; with weakly spiculose imbrications and scattered small spicules; length 0.125-0.170 mm. Cauda short, rounded, slightly constricted near the middle; with four or five slender, curved, pointed setae on each side, and sometimes a dorsal preapical one; with spiculose imbrications basally and coarse spicules apically. Anal and genital plates with coarse spicules and spiculose imbrications; with slender, pointed setae. Spiculose imbrications on venter of abdomen, on dorsum of abdominal segments VII and VIII, on coxae, on anterior surfaces of femora, on preapical rostral segments; smooth imbrications on antennae and tarsi; dorsum of abdomen distinctly reticulated. Length 1.35-1.75 mm.

*Alate Male*.—Colour in life: Essentially as in spring and fall migrants. Colour in macerated specimens: Essentially as in spring and fall migrants.

*Morphology*: Antenna shorter than body; sensoria on segment III 40-48, IV with 20-25, V with 17-20. Lengths of antennal segments: III, 0.45 mm.; IV, 0.275 mm.; V, 0.250 mm.; VI, 0.075 mm. + 0.5 mm. Dorsum of abdomen usually with small, irregular, median, dorsal, pigmented, sclerotic areas. All dorsal abdominal setae pointed. Length of hind tibia 0.92 mm. Length of cornicle 0.225 mm. Length 1.5 mm. Otherwise essentially as in spring and fall migrants.

*Type Material*.—Evidently lost. The name *padi* is used here in accordance with Opinion 563, *Opin. Int. Comm. Zool. Nom.* 20: 329-336.

*Distribution*.—Specimens examined from: B.C., on *Cinna latifolia* (Trev.) Griseb., *Avena sativa* L., *Triticum x aestivum* L., *Secale cereale* L.; N.B., on *Prunus serotina* Ehrh., *Prunus nigra* Ait., *Prunus pensylvanica* L., *Prunus virginiana* L., *Avena sativa* L., *Triticum x aestivum* L., *Zea mays* L., *Hordeum vulgare* L., *Phleum* sp.; ONT., on *Prunus virginiana*, *Prunus padus* L., *Prunus virginiana* var. *demissa* (Nutt. in T. & G.) Torr. (ornamental in Ontario), *Prunus hortulana* Bail. (ornamental in Ontario), *Poa* sp., *Triticum x aestivum* L., *Avena sativa* L., *Secale cereale* L., *Hordeum vulgare* L., *Zea mays* L., *Dactylis glomerata* L.; QUE., on *Elymus* sp., *Avena sativa* L.

*Comments*.—The eggs start to hatch on species of *Prunus* about the middle of April. Migrants are usually produced until the end of June, but some populations extend well into summer, especially on sucker growth at the bases of the trees. Alienicolae appear on grasses from the middle of May. In Europe the fundatrigeniae have been blamed for much distortion of the leaves of the winter host, causing them to become folded longitudinally. This type of damage was rarely noted in the vicinity of Ottawa, and where serious distortion was noticed it was found to be caused by *R. cerasifoliae*. The number of generations of alienicolae produced is unknown, but certainly several are produced. Fall migrants and sexuales occur on the winter host from the middle of September to the end of October.

In addition to the fact that fundatrigeniae are sometimes not produced it should also be noted that the alienicolae, or grass-infesting generations, in the early spring and late autumn sometimes closely resemble the fundatrigeniae in colour and structure. For example, one sometimes finds almost black, heavily flocculent apterae feeding on grasses. The dorsal setae in such forms are often long and pointed instead of being blunt or minutely capitate and in this way



resemble those of the migrants and fundatrigeniae. Also, the alienicolae in the autumn sometimes have a few, poorly formed, secondary sensoria on antennal segment III.

*R. padi* is very closely related to *R. viridis*, new species, and *R. fitchii*. The winged stages of these three species can be distinguished only with difficulty. Other stages of *R. padi* are readily distinguished from those of *R. viridis* by the characters given in the keys. The alienicolae can readily be confused with those of *R. fitchii* and records of *R. fitchii* invariably refer to *R. padi*. The alienicolae of these two species can only be distinguished by the slightly longer antennae and shorter, usually blunt or minutely capitate antennal setae in *padi*.

#### *Rhopalosiphum rufiabdominalis* (Sasaki)

1952 Palmer, M. A. Thomas Say Foundation 5: 223. *Rhopalosiphum splendens*.

1953 Cottier, W. Bull. N.Z. Dept. Sci. and Industr. Res. 106: 159. *Rhopalosiphum splendens*.

1956 Doncaster, J. P. Bull. Ent. Res. 47: 741-747. *Rhopalosiphum rufiabdominalis* (synonymy discussed).

*Alienicola*.—Colour in life: Dark green with reddish blotches around bases of cornicles. Colour in macerated specimens: Antennae, apical halves of femora and cornicles dark brown; head, rostrum, coxae, trochanters, basal halves of femora, apices of tibiae, cauda, anal and genital plates light brown; elsewhere light fuscous or colourless.

*Morphology*: Frontal and median tubercles well developed with long, slender pointed setae that are at least twice the basal diameter of antennal segment III. Setae on disc of head and dorsum of thorax all pointed and much longer than the basal diameter of antennal segment III. Antenna normally five-segmented, shorter than body. Lengths of antennal segments: III, 0.2-0.325 mm.; IV, 0.1-0.15 mm.; V, 0.075 mm. + 0.3-0.4 mm. Rostrum extending to middle coxae; apical segment 0.1-0.11 mm. long, with one or two setae in addition to usual three apical pairs and minute basal pair. Prothorax with well-developed lateral tubercles. Length of hind tibia 0.7-0.75 mm. Tibial setae mostly longer than apical diameters of tibiae except for a few on ventral surface near base. Lateral tubercles usually present on all abdominal segments. Dorsal abdominal setae all pointed and all several times the diameter of cornicle just proximad of flange. Cornicle roughly cylindrical, only slightly attenuated just proximad of flange; length 0.275-0.325 mm.; with spiculate imbrications. Cauda elongate, slightly constricted near middle, with two or three setae on either side, strongly spiculate. Anal plate strongly spiculate, with long, slender, pointed setae. Genital plate with strong spicules posteriorly, with spiculate imbrications anteriorly and with long, slender, curved setae. Dorsum of thorax and abdomen reticulated. Spiculate imbrications on venter of abdomen, on preapical rostral segments, anterior surfaces of coxae and on femora; smooth imbrications on tarsi and antennae.

*Alate Alienicola*.—Colour in life: Dark green with large reddish blotches around bases of cornicles. Colour in macerated specimens: Antennae, head, thorax, apical rostral segments, coxae, femora, apices of tibiae, tarsi, intersegmental sclerites, lateral sclerites, cornicles, cauda, anal plate, genital plate and transverse sclerotic bars on abdominal terga VII and VIII, dark brown; elsewhere light fuscous or colourless.

*Morphology*: Essentially as in apterous alienicola, but setae on antenna and legs somewhat shorter than in apterous alienicola. Antennae normally five-segmented. Antennal segment III with 16-22 sensoria, IV with 2-4. Lengths of antennal segments: III, 0.325-0.375 mm.; IV, 0.125 mm.; V, 0.06-0.075 mm. +

0.45-0.475 mm. Length of hind tibia 0.75-0.9 mm. Length of cornicle 0.20-0.225 mm. Length 1.5 mm.

*Type Material*.—Evidently lost. The name used here follows arguments put forth by Doncaster, 1956.

*Distribution*.—Not known to occur naturally in Canada. The only occurrence is on stored bulbs of *Tigridia* sp. imported from the Netherlands. It occurs widely throughout the world (Doncaster, 1956).

*Comments*.—This species feeds below the surface of the soil and has been recorded from a long list of plants including cereal crops (Doncaster, 1956). The material that was collected on *Tigridia* sp. was readily transferred to wheat.

The species is readily recognized by the relatively long antennal and body setae and also the presence of four or five setae on abdominal tergum VIII. Confusion with other species of *Rhopalosiphum* is unlikely, but it may be confused with species of *Paraschizaphis* H.R.L. which also have very long setae, but in which the cornicles are virtually cylindrical and not abruptly attenuated just proximad of the flange.

#### *Rhopalosiphum rufulum*, new species

1931 Hottes, F. C., and Frison, T. H. Bull. Ill. Nat. Hist. Surv. 29: 239. *Rhopalosiphum prunifoliae* (part).

*Fundatrix*.—Colour in life: Thorax and abdomen light green to yellow; legs brownish, except apices of tibiae and tarsi which are black; head light brown; antennae dark, segments IV-V almost black; cornicles black; with very large, dark-red or maroon-coloured blotches around bases of cornicles; not pulverulent. Colour in macerated specimens: Thorax and abdomen colourless to slightly fuscous; head, basal three antennal segments, coxae, trochanters, femora and basal four-fifths of tibiae light brown; cornicles, apical two antennal segments, apices of tibiae, tarsi, cauda, anal and genital plates dark brown, spiracular sclerites light to dark brown.

*Morphology*: Frontal tubercles poorly developed, slightly scabrous, normally without setae, but these, when present, curved, pointed and longer than basal diameter of antennal segment III; median tubercle well developed with a slender pointed seta on each side, each of which is about  $1\frac{1}{2}$  times the basal diameter of antennal segment III. Setae on disc of head pointed or capitate, shorter than basal diameter of antennal segment III when capitate, but usually longer when pointed. Antenna shorter than body, usually five-segmented but sometimes four-segmented. Lengths of antennal segments: III, 0.275-0.3 mm.; IV, 0.1-0.125 mm.; V, 0.175 mm. + 0.1 mm. Setae on antennal segments I and II blunt, equal to basal diameter of segment III; those on segment III usually pointed on basal half and shorter than basal diameter, blunt or minutely capitate on apical half and equal to basal diameter; setae on segments IV and V blunt and usually at least equal to basal diameter of III. Rostrum reaching to middle coxae; apical segment 0.125-0.13 mm. long, with two setae in addition to usual three apical pairs and minute basal pair. Prothorax usually with well developed lateral tubercles. Dorsal thoracic setae usually minutely capitate and about the same length as those on disc of head. Setae on legs mostly slender and pointed, but usually a few blunt or distinctly capitate ones occur on apices of femora and on basal halves of pointed and arranged in two irregular transverse rows on each segment. Cornicle tibiae; mostly shorter than apical diameters of tibiae except on dorsal surfaces of apical fifth of hind tibia where there are always a few setae that are about equal to the apical diameter of hind tibia. Length of hind tibia 0.85-1.11 mm. Except for small spiracular sclerites, abdomen without pigmented sclerotic areas;

lateral tubercles present or absent. Setae on dorsum of abdominal terga I-VII normally minutely capitate and shorter than diameter of cornicle just proximad of flange; setae on tergum VIII normally pointed and equal to or longer than diameter of cornicle just proximad of flange. Ventral abdominal setae slender, nearly cylindrical, slightly tapered, strongly attenuated just proximad of flange, with weakly spiculose imbrications; length of cornicle 0.175-0.2 mm. Cauda elongate, sometimes distinctly constricted about the middle; with three or four slender, curved, pointed setae on each side and sometimes a dorsal preapical one; strongly spiculose. Anal plate strongly spiculose, with slender, curved, pointed setae. Genital plate with strongly spiculose imbrications and slender, pointed setae. Dorsum of thorax and abdomen without evident sculpturing; spiculose imbrications on venter of abdomen, on abdominal terga VII and VIII, on anterior surfaces of femora, and on preapical rostral segments. Smooth imbrications on antennae and tarsi. Length 2.0-2.6 mm.

*Fundatrigenia*.—Colour in life: Head and body largely maroon with irregular areas of green or yellowish pigment on abdomen; legs largely fuscous except basal four-fifths of tibiae which are yellow; antennal segment III yellow or light brown, other segments dark brown to black; cornicle and cauda dark brown to black; conspicuous pulverulence on dorsum of head, on thorax, and in dorsolateral, rectangular patches on abdominal terga I-V or VI. Colour in macerated specimens: Rostrum, antennal segment IV-VI, coxae, apices of femora, apices of tibiae, tarsi, cornicles, cauda, anal and genital plates dark brown; elsewhere fuscous or colourless.

Morphology: Frontal tubercles well developed, each with a slender pointed seta that is as long as basal diameter of antennal segment III; disc of head with pointed setae of which are as long as basal diameter of antennal segment III. Antenna shorter than body, six-segmented. Lengths of antennal segments: III, 0.23-0.35 mm.; IV, 0.15-0.2 mm.; V, 0.1-0.2 mm.; VI, 0.1-0.125 mm. + 0.21-0.375 mm. Setae on basal third of antennal segment III less than half basal diameter; all other setae equal to or longer than basal diameter of segment III. Rostrum extending to middle coxae; apical segment 0.13-0.17 mm. long, with two setae in addition to usual three apical pairs and minute basal pair. Prothorax with well developed lateral tubercles; all dorsal prothoracic setae pointed, longer than basal diameters of antennal segment III; all dorsal abdominal setae with small fuscous spots at their bases. Length of hind tibia 0.8-1.0 mm. Setae on legs mostly pointed except for a few blunt or minutely capitate ones near apices of femora and basal portions of tibiae; all tibial setae shorter than apical diameters of tibiae. First tarsal segments of fore and middle legs each with three setae, two on first segment of each hind tarsus. Dorsum of abdomen usually with small inter-segmental sclerites, otherwise without pigmented sclerotic areas except for pigmented spots on bases of the two setae on segment VIII. Lateral tubercles usually present on all segments. Setae on abdominal terga I-VI usually pointed, sometimes blunt or distinctly capitate, usually equal to or slightly longer than diameter of cornicle just proximad of flange; setae on terga VII and VIII normally pointed and usually at least  $1\frac{1}{2}$  times the diameter of cornicle just proximad of flange. Cornicle roughly cylindrical, slightly tapered, attenuated just proximad of flange, with strongly spiculose imbrications; length 0.2-0.275 mm. Cauda elongate, sometimes slightly constricted near middle with two or three setae on each side and sometimes a dorsal preapical one; strongly spiculose. Anal plate strongly spiculose, with long, slender, pointed setae. Genital plate spiculose and with strongly spiculose imbrications. Spiculose imbrications on venter of abdomen, on abdominal terga VII and VIII, on anterior surfaces of femora and on

preapical rostral segments; smooth imbrications on tarsi and antennae; integument of thorax and abdomen without evident sculpturing. Length 2.0-2.5 mm.

*Alatoid Nymph*.—Colour in life: Head and thorax green with varying amounts of red; abdomen usually green with a median-dorsal and lateral strips of maroon-coloured pigment; coxae, trochanters, apical halves of femora, apices of tibiae and tarsi dark brown to black, other parts of legs yellow or green; apices of antennae, wing pads, and cornicles jet black. Colour in macerated specimens: Dorsum of head, most of antennae, apical rostral segment, coxae, trochanters, hind femora, apices of tibiae, tarsi, cornicles and wing pads dark brown to black; elsewhere light fuscous or colourless.

**Morphology:** Frontal tubercles each with a slender, curved, pointed seta that is equal to or slightly shorter than basal diameter of antennal segment III; setae on disc of head all pointed and longer than basal diameter of segment III. Antenna six-segmented. Lengths of antennal segments: III, 0.2-0.3 mm.; IV, 0.12-0.2 mm.; V, 0.12-0.175 mm.; VI, 0.075-0.11 mm. + 0.23-0.375 mm. Length of apical rostral segment 0.125-0.16 mm. Dorsal thoracic setae pointed, mostly longer than basal diameter of antennal segment III and the small, basal papillae fuscous. Dorsal abdominal setae, arising from small, fuscous papillae, pointed, normally longer than diameter of cornicle just proximad of flange. Length of hind tibia 0.7-0.95 mm. Length of cornicle 0.175-0.23 mm. Length 2.0-2.5 mm. Otherwise essentially as in fundatrix.

*Spring Migrant*.—Colour in life: Sclerotic portions of head and thorax dark brown to black, ground colour slightly ochereous; antennae dark, ground colour ochereous; femora, apices of tibiae and tarsi dark brown to black, other parts of legs ochereous; ground colour of abdomen green with a darker median-dorsal and dorsolateral stripe, but flecked with varying amounts of red or ochereous pigment, especially in the median-dorsal and dorsolateral regions; cornicles, lateral sclerites, intersegmental sclerites, spiracular sclerites, cauda, anal plate and transverse sclerites on terga VII and VIII dark brown to black. Colour in macerated specimens: Essentially as in the spring migrant of *R. fitchii*.

**Morphology:** Frontal tubercles evident, each with a slender pointed seta that is shorter than the basal diameter of segment III; setae on disc of head usually pointed, about as long as basal diameter of segment III. Antenna shorter than body, six-segmented; segment III with 12-23 secondary sensoria, IV with 5-12, V with 0-4. Lengths of antennal segments: III, 0.275-0.325 mm.; IV, 0.175-0.225 mm.; V, 0.15-0.225 mm.; VI, 0.10-0.125 mm. + 0.25-0.33 mm. Setae on antennal segments normally pointed, sometimes blunt, usually half the basal diameter of segment III. Prothorax with well-developed lateral tubercles; dorsal setae pointed, as long as setae on disc of head. Membrane of wings hyaline, media of forewing two-branched. Length of hind tibia 0.8-1.1 mm. Tibial setae shorter than apical diameters of tibiae, mostly pointed, but sometimes a few blunt setae near apices of femora and bases of tibiae. First tarsal segment of fore and middle legs each with three setae, those of hind legs each with two. Dorsum of abdomen largely membranous except for pigmented intersegmental sclerites and pigmented sclerotic bars on terga VII and VIII. Setae on abdominal terga I-V pointed, equal to half the diameter of cornicle just proximad of flange; setae on abdominal tergum VI three-fourths the diameter of cornicle just proximad of flange; setae on tergum VIII equal to, or longer than diameter of cornicle just proximad of flange. Ventral abdominal setae, slender, pointed, arranged in two irregular transverse rows on each segment. Cornicle roughly cylindrical, but diameter in middle greater than that just proximad of flange and at base; 0.15-0.20 mm. long.

Cauda elongate, distinctly constricted at middle; with two or three setae on each side and usually a dorsal preapical one; strongly spiculose. Anal plate coarsely spiculose, with long, slender pointed setae. Genital plate with spiculose imbrications and slender pointed setae. Genital plate with spiculose imbrications and slender pointed setae. Spiculose imbrications on venter of abdomen, on abdominal terga VII and VIII, on anterior surfaces of femora and on preapical rostral segments; smooth imbrications on tarsi and antennal segments; dorsum of thorax and abdomen without evident sculpturing. Length 2.0-2.5 mm.

*Type Material*.—No. 7032 in Canadian National Collection. Holotype: Fundatrix, Ottawa, Ont., May 24, 1958 (W. R. Richards), on *Crataegus* sp. Paratypes: 10 fundatrices (same data as holotype); 8 fundatrigeniae, June 8, 1958 (W. R. Richards), on *Crataegus* sp.; 20 spring migrants, Ottawa, Ont., May 24-June 8, 1958 (W. R. Richards) on *Crataegus* sp.

*Distribution*.—Known only from the type series and a fundatrix from Illinois.

*Comments*.—This species is relatively rare and tends to be solitary. It could not be induced to feed on any species of grass or sedge. Confusion with any other species of *Rhopalosiphum* is unlikely because of its distinctive colour in living material and the differences given in the keys for macerated material. An additional means of distinguishing this species is the fact that the fundatrices produce brownish larvae instead of green ones as is the case for other species on Pomeae.

#### *Rhopalosiphum viridis*, new species

1947 Rogerson, J. P. Bull. Ent. Res. 38: 168. *Rhopalosiphum crataegellum* (part).

1957 Börner, C. In Sorauer, Handb. d. Pflanz. 5: 97. *Rhopalosiphum oxycanthae* (part).

*Fundatrix*.—Colour in life: Light green, abdomen with a darker-green median-dorsal and dorsolateral stripe; without reddish blotches around the bases of the cornicles; legs and antennae light green or yellowish, except apices of tibiae, whole of tarsi and apical two antennal segments, which are black; cornicles light coloured except apices, which are black; cauda fuscous. Colour in macerated specimens: Apical two antennal segments, apical rostral segment, apices of tibiae, whole of tarsi; apices of cornicles, cauda and anal plate various shades of brown; elsewhere slightly fuscous or colourless.

*Morphology*: Frontal tubercles poorly developed; setae on disc of head usually minutely capitate, sometimes pointed, equal to half to three-quarters the basal diameter of antennal segment III. Antenna shorter than body, segments III and IV always fused; primary sensoria with strongly ciliated margins. Lengths of antennal segments: III, 0.3-0.5 mm.; IV, 0.1-0.12 mm.; V, 0.075-0.1 mm. + 0.15-0.225 mm. Setae on antennal segments I and II blunt or distinctly capitate, equal to two-thirds to three-fourths the basal diameter of antennal segment III; setae on III-VI blunt, usually equal to half basal diameter of III. Rostrum reaching slightly beyond middle coxae; apical segment 0.125-0.15 mm. long, with two setae in addition to the usual three apical pairs and minute basal pair. Prothorax with well-developed lateral tubercles. All dorsal thoracic setae minutely but distinctly capitate, about the same length as those on disc of head. Length of hind tibia 0.8-0.95 mm. Setae on legs usually slender, pointed, sometimes blunt, most of them shorter than apical diameters of tibiae, except for those on dorsal surface of apical half of hind tibia where they are long, erect, pointed, curved, and equal to three-fourths or more the apical diameter of hind tibia. Except for small spiracular sclerites, abdomen without pigmented sclerotic areas; lateral tubercles present on segment I-VIII, usually absent on other segments. Setae on dorsum of abdomen usually minutely but distinctly capitate, those on



segments I-VII one-third to one-half the basal diameter of antennal segment III, those on segment III equal to three-fourths or more of the basal diameter of antennal segment III; ventral abdominal setae all slender and pointed. Cornicle nearly cylindrical, narrower at base than at apex, with well-developed flange and scattered, minutely spiculate imbrications; length 0.2-0.25 mm. Cauda elongate, not constricted at middle; strongly spiculate with three to five slender, curved, pointed setae on each side. Anal and genital plates strongly spiculate, with slender, pointed setae. Dorsum of abdomen faintly reticulate; spiculate imbrications on venter of abdomen, on terga of abdominal segments VII and VIII, and on anterior surfaces of femora; smooth imbrications on tarsi, anterior surface of antennal segment III, and whole of segments IV-VII. Length 2.3-2.5 mm.

*Alatoid Nymph*.—Colour in life: Similar to that of fundatrix, but dorsal longitudinal abdominal stripes less conspicuous. Colour in macerated specimens: Wing pads not fuscous, otherwise essentially as in fundatrix.

Morphology: Lengths of antennal segments: III, 0.225-0.25 mm.; IV, 0.125-0.15 mm.; V, 0.12-0.125 mm.; VI, 0.075 mm. + 0.3 mm. Setae on disc of head, antenna and abdominal tergum VIII pointed and slender. Otherwise essentially as in fundatrix. Length 1.3-1.6 mm.

*Spring Migrant*.—Colour in life: Head, dorsum of prothorax, whole of pterothorax, apices of tibiae, tarsi, lateral and intersegmental sclerites black; femora and basal portion of tibiae brownish; antennae dark brown except for base of segment III which is lighter; dorsum of abdomen light green with a darker median-dorsal and lateral stripe; venter dark green, without pruinosity. Colour in macerated specimens: Head, antennae except for the base of segment III, dorsum of prothorax, pterothorax, femora, apices of tibiae, tarsi, lateral and intersegmental sclerites, cornicles, cauda, apical segment of rostrum, anal and genital plates dark brown; other regions colourless or slightly fuscous.

Morphology: Frontal tubercles evident, each with a slender pointed seta that is usually slightly shorter than basal diameter of antennal segment III; seta on disc of head usually pointed nearly equal to basal diameter of antennal segment III. Antenna shorter than body; segment III with 12-22 secondary sensoria; IV with 3-10, V with 0-2. Lengths of antennal segments: III, 0.273-0.375 mm.; IV, 0.2-0.225 mm.; V, 0.15-0.2 mm.; VI, 0.1-0.125 mm. + 0.3-0.4 mm. Setae on antennal segments usually pointed and at least half the basal diameter of segment III. Rostrum extending to middle of mesothorax; apical segment with two setae in addition to the three apical pairs and the minute basal pair; length of apical segment 0.125-0.14 mm. Prothorax with well developed lateral tubercles; dorsal setae usually minutely capitate. Dorsum of pterothorax with minute blunt setae; venter with a few slender pointed ones. Membrane of wings hyaline; media of forewing two-branched. Length of hind tibia 0.9-1.075 mm. Tibial setae all shorter than apical diameters of tibiae, longer and more spinelike on apical halves, sometimes a few blunt setae on basal fourths. First tarsal segments of fore and middle legs each with three setae, two on first segment of hind tarsus. Dorsum of abdomen membranous except for pigmented intersegmental sclerites, a small diffuse patch on tergum VII and a larger one on VIII. Setae on abdominal terga I-VI minutely capitate, less than half of apical diameter of cornicle just proximad of flange; setae on terga VII and VIII usually pointed, and from half to three-fourths the diameter of cornicle just proximad of flange. Ventral abdominal setae, slender, pointed, arranged in two, irregular, transverse rows on each segment. Cornicle nearly cylindrical, abruptly attenuated just proximad of flange; 0.175-0.25 mm. long. Cauda elongate, slightly constricted near the middle, with

two to four slender, curved, pointed setae on each side; coarsely spiculose. Anal plate coarsely spiculose. Genital plate with heavy spiculose imbrications. Spiculose imbrications on venter of abdomen, on abdominal terga VII and VIII, on lateral sclerites, on anterior surfaces of coxae and femora; smooth imbrications on tarsi, anterior surface of antennal segment III and on segments IV-VI. Length 2.0-2.5 mm.

*Apterous Alienicola*.—Colour in life: Body pale green, without reddish blotches around bases of cornicles; cornicles and appendages usually brownish, apices of tibiae, tarsi and antennae slightly darker. Colour in macerated specimens: Head, rostrum, antennal segments, legs, cornicles and cauda brown.

Morphology: Frontal tubercles well developed, each with a slender curved, pointed setae that is equal to the basal diameter of antennal segment III; median tubercle with a long slender seta on each side, each of which is nearly twice the basal diameter of antennal segment III; setae on disc of head pointed and the same length as those on frontal tubercles. Antenna shorter than body, five-segmented. Lengths of antennal segments: III, 0.175-0.25 mm.; IV, 0.075-0.8 mm.; V, 0.05-0.06 mm. + 0.32-0.35 mm. Antennal setae pointed, usually as long as the basal diameter of segment III. Rostrum extending to middle coxae; apical segment 0.1-0.125 mm. long, with two setae in addition to usual three apical pairs and minute basal pair. Prothorax with well-developed lateral tubercles; all dorsal thoracic setae pointed and as long as those on frontal tubercles and disc of head. Tibial setae all erect and spinelike, shorter than apical diameters of tibiae; those on dorsal surface of basal half of hind tibia as long as or only slightly shorter than those on apical half. Length of hind tibia 0.5-0.6 mm. First segments of fore and middle legs each with three setae, those on hind legs each with two. Dorsum of abdomen without pigmented, sclerotic areas; all dorsal setae pointed and as long as, or longer than those on disc of head, equal to or longer than basal diameter of antennal segment III. Lateral abdominal tubercles usually present on all segments. Cornicle roughly cylindrical, strongly attenuated just proximad of flange, with minutely spiculose imbrications; length 1.3-1.6 mm. Cauda elongate, slightly constricted near middle, with two or three setae on each side and sometimes a dorsal, preapical one; coarsely spiculose.

*Alate Alienicola*.—Colour in life: Essentially as in spring migrant. Colour in macerated specimens: Essentially as in spring migrant.

Morphology: Antenna shorter than body, five or six-segmented; when six-segmented, segment III with 16-18 sensoria, IV with 3-4 and V with one or two; when five-segmented, segment III-IV with 9-16 sensoria. Lengths of antennal segments: III, 0.25-0.3 mm.; IV, 0.1-0.15 mm. (III + IV, 0.25-0.325 mm., in five-segmented forms); V, 0.08-0.1 mm.; VI, 0.05-0.075 mm. + 0.325-0.375 mm. Length of hind tibia 0.6-0.85 mm. Dorsum of abdomen with large, transverse, sclerotic bars on terga VII and VIII. Setae on dorsum of abdomen pointed, those on segments I-V shorter than half the diameter of cornicle, just proximad of flange; those on segments VI-VIII pointed and longer. Length of cornicle 0.15-0.175 mm. Length 1.3-1.5 mm. Otherwise essentially as in spring migrant.

*Fall Migrant*.—Colour in life: Essentially as in spring migrant. Colour in macerated specimens: Essentially as in spring migrant.

Morphology: Antenna shorter than body; segment III with 10-22 secondary sensoria, IV with 2-8, V with 0-3. Lengths of antennal segments: III, 0.2-0.325 mm.; IV, 0.1-0.175 mm.; V, 0.1-0.15 mm.; VI, 0.075-0.1 mm. + 0.325-0.45 mm. Setae on dorsum of prothorax usually pointed, about the same length as those on dorsum of head. Length of hind tibia 0.8-1.0 mm. Length of cornicle

0.175-0.225 mm. Length 0.15-0.20 mm. Otherwise essentially as in spring migrant. Anal and genital plates strongly spiculose, with slender, curved, pointed setae. Dorsum of thorax and abdominal segments I-V with strong reticulations. Spiculose imbrications present on venter of abdomen, on dorsa of abdominal segments VII and VIII, on anterior surfaces of femora and on preapical rostral segment. Smooth imbrications on tarsi and antennae. Length 1.3-1.6 mm.

*Apterous Oviparous Female.*—Colour in life: Thorax and abdomen pale green to yellowish, without reddish blotches at bases of cornicles; cornicles, apical antennal segments, apex of rostrum, apices of tibiae, whole of tarsi dark brown to black; head, basal part of antennae, basal part of rostrum, coxae, trochanters, femora, basal parts of tibiae and the cauda brownish. Colour in macerated specimens: Head, antennae, legs, rostrum, cornicles, cauda and anal plate light to dark brown; elsewhere colourless or nearly so.

*Morphology:* Frontal tubercles well developed, each with a pointed seta that is equal to the basal diameter of antennal segment III; median tubercle with a seta on each side that is  $1\frac{1}{2}$  times the basal diameter of antennal segment III; setae on disc of head usually pointed, about the same length as those on frontal tubercles. Antenna shorter than body, five-segmented; secondary sensoria absent. Lengths of antennal segments: III, 0.175-0.225 mm.; IV, 0.075-0.1 mm.; V, 0.06-0.075 mm. + 0.255-0.275 mm. Setae on antennal segment III about half the basal diameter of segment III, other antennal setae about equal to basal diameter of III. Rostrum almost reaching hind coxae; apical segment 0.1-0.11 mm. long, with two setae in addition to the usual three apical pairs and minute basal pair. Prothoracic lateral tubercles, small, inconspicuous. All dorsal thoracic setae minutely capitate, the same length as those on disc of head. Setae on legs mostly pointed, sometimes blunt on dorsal surface of femora and basal portion of tibiae. Hind tibia slightly swollen, with numerous, round flat sensoria. Length of hind tibia 0.475-0.55 mm. All first tarsal segments with two setae on ventral surfaces. Abdomen without pigmented sclerotic areas. Abdominal terga I-V with minutely capitate setae that are shorter than those on disc of head; setae on terga VI-VIII usually pointed, at least twice as long as those on disc of head. Lateral abdominal tubercles minute, or absent. Venter of abdomen with slender, pointed setae that are arranged in two, irregular transverse rows on each segment. Cornicle almost cylindrical, slightly attenuated just proximad of flange, with weakly spiculose imbrications. Cauda short, rounded or triangular at apex; with two or three setae on each side; with spiculose imbrications basally and coarse spicules apically. Anal plate with coarse spicules, genital plate with spiculose imbrications; both plates with slender, pointed setae. Spiculose imbrications on venter of abdomen, and on dorsa of abdominal segments VII and VIII, on anterior surfaces of femora and on preapical rostral segments; smooth imbrications on tarsi and antennal segments; dorsum of abdomen and thorax strongly reticulated. Length 1.3-1.5 mm.

*Alate Male.*—Colour in life: Essentially as in spring and fall migrants, but abdomen paler, sometimes yellowish. Colour in macerated specimens: Essentially as in spring and fall migrants.

*Morphology:* Antenna shorter than body; 24-33 sensoria on segment III, 14-16 on IV, 10-13 on V, and 0-1 on base of VI. Lengths of antennal segments: III, 0.25-0.325 mm.; IV, 0.14-0.175 mm.; V, 0.125-0.15 mm.; VI, 0.05-0.175 + 0.3-0.43 mm. Dorsum of each abdominal segment with an irregular, median-dorsal, pigmented, sclerotic patch. All dorsal abdominal setae pointed, those on segments V-VIII at least twice as long as those on segment I-IV. Length of

cornicle 0.15-0.2 mm. Length of hind tibia 0.65-0.95 mm. Otherwise as in spring and fall migrants.

**Type Material.**—No. 7033 in Canadian National Collection. Holotype: Apterous alienicola, June 16, 1958, Ottawa, Ont. (W. R. Richards), on *Triticum x aestivum* L. Paratypes: six fundatrices, May 5, 1958 (W. R. Richards), on *Sorbus* sp.; 63 spring migrants, May 27, 1958 (W. R. Richards), on *Sorbus* sp.; four apterous alienicolae, June 15, 16, 17, 30, 1958 (W. R. Richards), on *Triticum x aestivum* L.; 11 alate alienicolae, June 4, 24, 30, July 2, 1958 (W. R. Richards), on *Triticum x aestivum* L.; 10 fall migrants, Oct. 1, 1958 (W. R. Richards), on *Sorbus* sp.; four oviparae, Sept. 29, Oct. 2, 9, 1958 (W. R. Richards), on *Sorbus* sp.; two males, Sept. 27, Oct. 9, 1958 (W. R. Richards), on *Sorbus* sp.

**Distribution.**—Known only from type series.

**Comments.**—The alienicolae of this species are inseparable from the species that is being called *R. insertum* (Walker) by European workers. However, Walker's name was used for a species collected on *Mespilus germanica* L., and until populations that overwinter on *Mespilus* sp. have been positively associated with definite alienicolous populations, the use of *insertum* is not justified, except in the strict sense used by Walker.

The biology of this species was discussed in considerable detail by Rogerson (1947), but he also assumed that the species overwintered on *Crataegus* sp. and *Malus* sp. as well as *Sorbus* sp., a conclusion which could not be demonstrated in the present study.

Börner (1957) used *oxycanthae* Schrank for what appears to be a mixture of this species and *fitchii*, or a form very closely related to it. He (page 98) stated that the alienicolae of *oxycanthae* are completely green, but includes a variety in which red, dorsal, abdominal blotches are present, which agrees well with *fitchii*, as appears to be supported by material from Europe that was examined for the present study.

This species overwinters in the egg stage and evidently only on *Sorbus*. The eggs hatch near the middle of April and migration to grasses is completed toward the end of May. Alienicolae were not found in the field, but in the laboratory they always occurred at the bases of the plants or just below the surface of the soil. Fall migrants and sexuales occur on *Sorbus* from the middle of September to the end of October. It is possible that this species also overwinters on *Cotoneaster* sp., as similar fundatrices and migrants were found on these plants, but these could not be reared. Fundatrigeniae are not produced in this species.

This species is very closely related to *R. fitchii* and the fundatrices and migrants of the two species cannot be distinguished. It differs from *fitchii* by the absence of fundatrigeniae, by the absence of reddish blotches around the bases of the cornicles in the alienicolae and oviparae, and by the fact that the alienicolae feed below the surface of the soil.

Although the alienicolae of this species were not found in the field, in the laboratory small populations could be established on wheat. These small cultures produced mostly alatae and very few apterous alienicolae, which may indicate that wheat is not an entirely satisfactory food plant.

Fundatrices that were collected on *Sorbus* sp. would not reproduce when transferred to *Crataegus* sp. and *Malus* sp.

#### Other Species in North America

*Rhopalosiphum parvae* (Hottes and Frison), 1931 *Bull. Ill. Nat. Hist. Surv.* 29: 237.—Known only from Illinois and originally considered to be a form of

*enigmae*. However, this species is not closely related to *enigmae*, but is almost inseparable from *scirpifolii*. The only notable difference is that there are only five antennal segments in *parvae* whereas *scirpifolii* evidently always has six. Also, *parvae* has only been collected on *Carex* sp. whereas *scirpifolii* has been associated with *Prunus besseyi* (Bailey) and *Scirpus* sp. This species may be the summer form of *rufulum*.

*Rhopalosiphum scirpifolii* Gillette and Palmer, 1932 *Ann. Ent. Soc. America* 25: 138.—Similar to *parvae* and to *niger*. It can be distinguished from the former as indicated above, and from the latter by the fact that the setae on the ventral and dorsal surfaces of the pro- and meso-tibiae are about equal in length. As yet this species is known only from Colorado and Idaho.

#### Doubtful Species

*Aphis inserta* Walker, *Zoologist* 7: 39. This name is gradually becoming used for all *Rhopalosiphum* associated with, or believed to be associated with, Pomeae in Europe. However, in view of the fact that there are a number of closely related species associated with Pomeae, it seems best to use Walker's name only for material associated with *Mespilus* sp. as indicated in Walker's original description. It should also be noted that Walker's original description is based on a "Wingless viviparous female", but according to Eastop (in litt.) the types are winged specimens and alate nymphs, so there is no way of ascertaining that the available types are the same as those on which Walker's description was based.

*Aphis annuae* Oestlund, *Minnesota Geol. Nat. Hist. Surv.* 14: 43. Without examination of types, this species was thought to be referable to the genus *Rhopalosiphum* by Börner (1957) and Palmer (1952). However, there is nothing in Oestlund's descriptions that would permit one to place the species in *Rhopalosiphum*, and types were not available for this study.

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## ILLUSTRATIONS

Figs. 2-3. *Rhopalosiphum cerasifoliae* (Fitch) and *R. enigmae* (H. and F.). A, Third antennal segment. B, Fourth antennal segment. C, Fifth antennal segment. D, Dorsum of left side of head of apterous alienicola. E, Dorsum of apical portion of left side of abdomen of apterous alienicola. F, Dorsum of apical portion of abdomen of alate alienicola.

Fig. 4. *Rhopalosiphum fitchii* (Sand.). A, Fused third and fourth antennal segments. B, Fifth antennal segment. C, Dorsum of left side of head of apterous alienicola. D, Dorsum of apical portion of left side of abdomen of apterous alienicola. E, Dorsum of apical portions of left side of abdomen of alate alienicola.

Fig. 5. *Rhopalosiphum maidis* (Fitch). A, Third antennal segment. B, Fourth antennal segment. C, Fifth antennal segment. D, Dorsum of left side of head of apterous alienicola. E, Dorsum of apical portion of left side of abdomen of apterous alienicola. F, Dorsum of apical portion of left side of abdomen of alate alienicola.

Figs. 6-7. *Rhopalosiphum niger*, new species, and *Rhopalosiphum nymphaeae* (L.). A, Third antennal segment. B, Fourth antennal segment. C, Fifth antennal segment. D, Dorsum of left side of head of apterous alienicola. E, Dorsum of apical portion of abdomen of apterous alienicola. F, Dorsum of apical portion of abdomen of alate alienicola.

Fig. 8. *Rhopalosiphum padi* (L.). A, Third antennal segment. B, Fourth antennal segment. C, Fifth antennal segment. D, Dorsum of left side of head of apterous alienicola. E, Dorsum of apical portion of left side of abdomen of apterous alienicola. F, Dorsum of apical portion of left side of abdomen of alate alienicola.

Fig. 9. *Rhopalosiphum rufiabdominalis* (Sas.). A, Fused third and fourth antennal segments. B, Fifth antennal segment. C, Dorsum of left side of head of apterous alienicola. D, Dorsum of apical portion of abdomen of apterous alienicola. E, Dorsum of apical portion of abdomen of alate alienicola.

Fig. 10. *Rhopalosiphum viridis* new species. A, Fused third and fourth antennal segments. B, Fifth antennal segment. C, Dorsum of left side of head of apterous alienicola. D, Dorsum of apical portion of left side of abdomen of apterous alienicola. E, Dorsum of apical portion of left side of abdomen of alate alienicola.

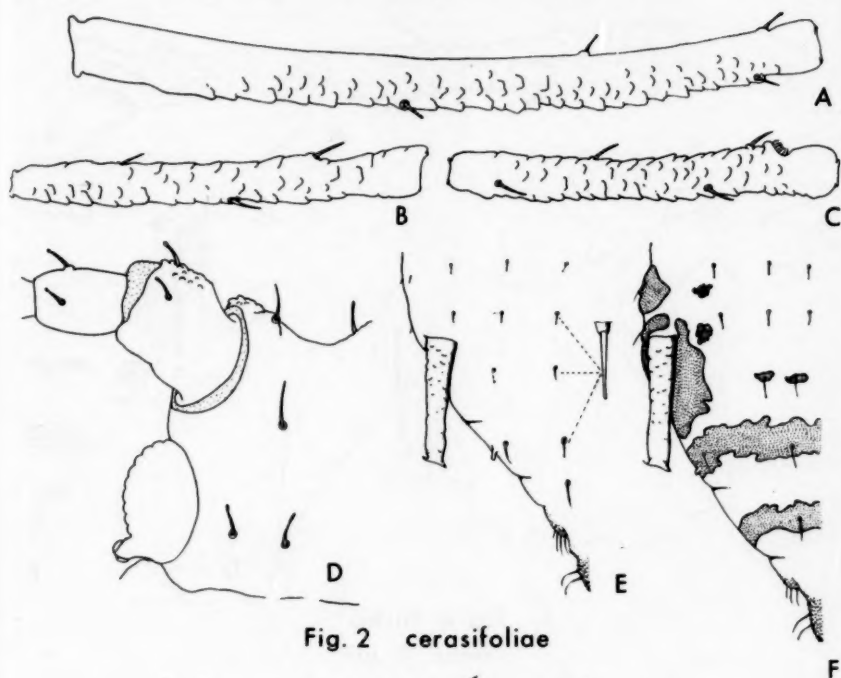


Fig. 2 cerasifoliae

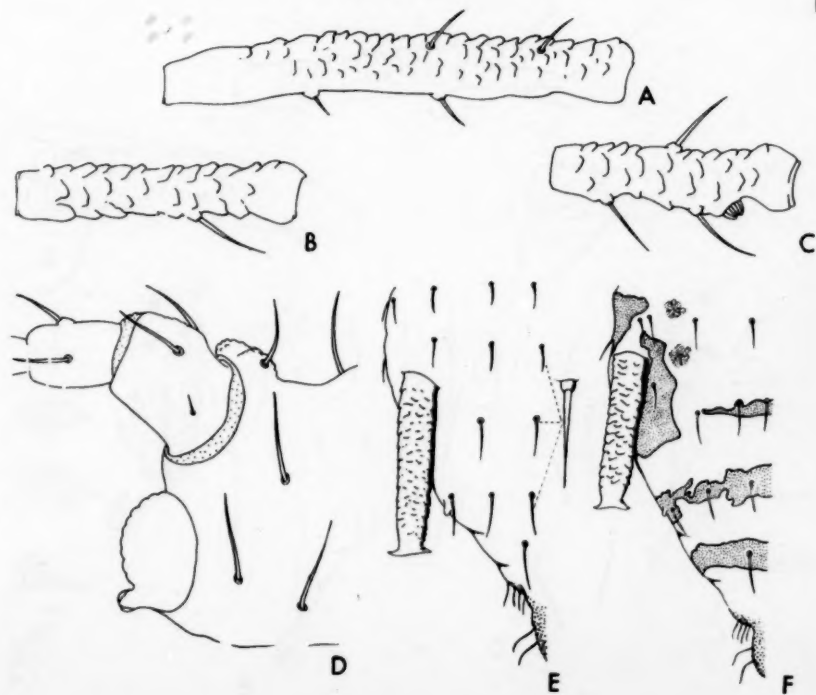


Fig. 3 enigmae

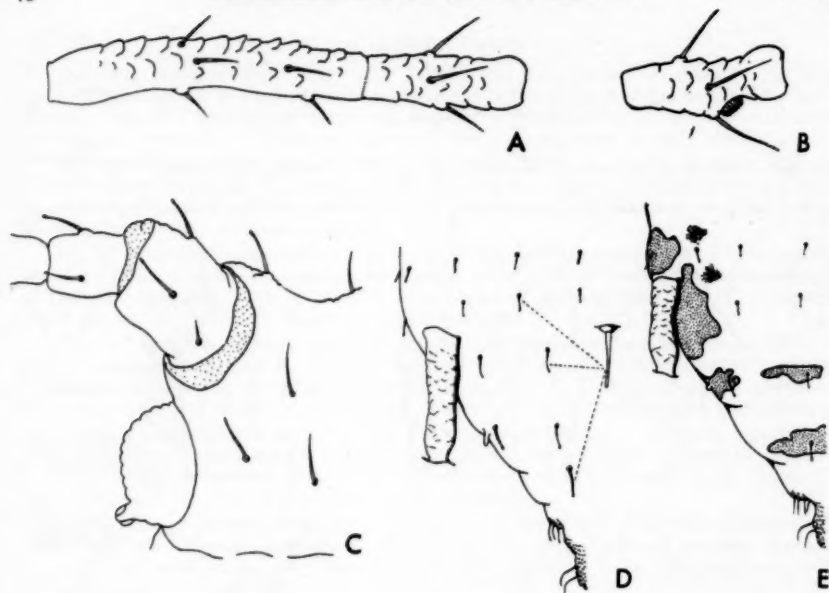


Fig. 4 fitchii

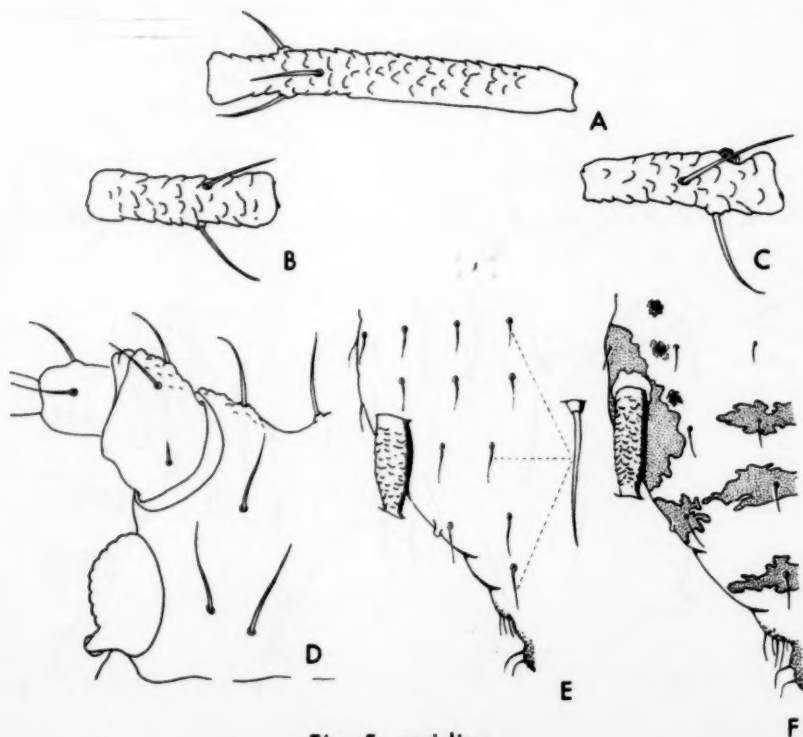


Fig. 5 maidis

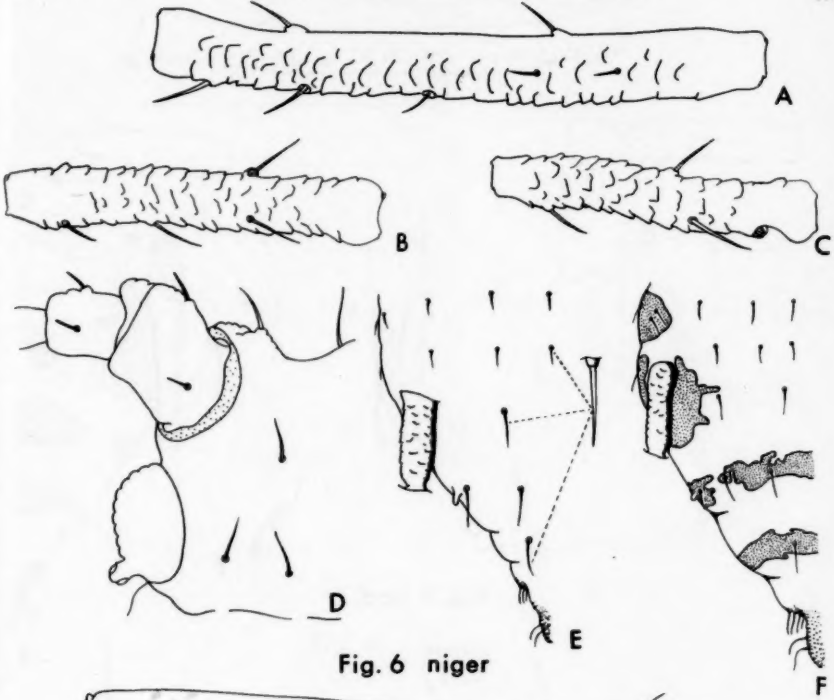


Fig. 6 niger

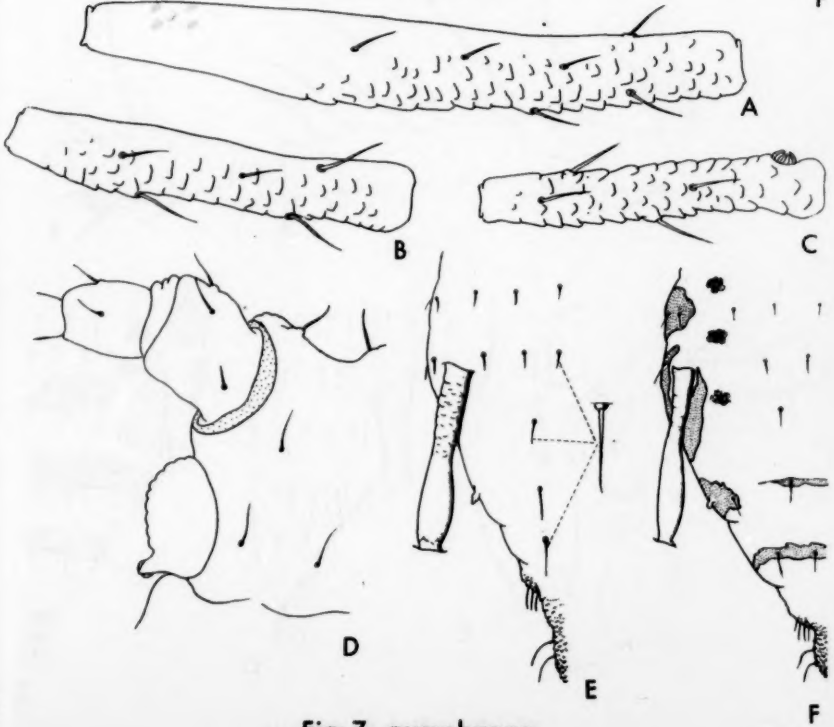


Fig. 7 nymphaeae



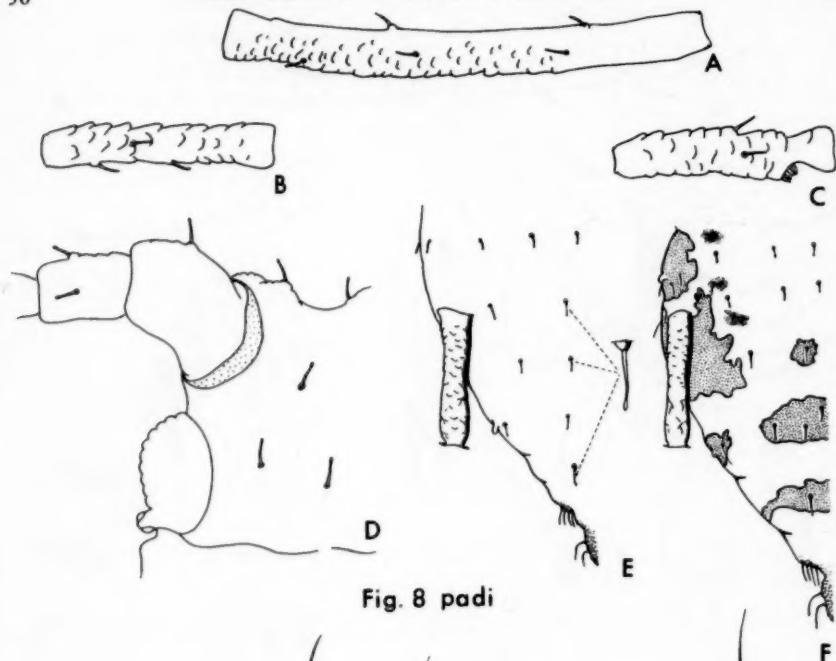


Fig. 8 padi

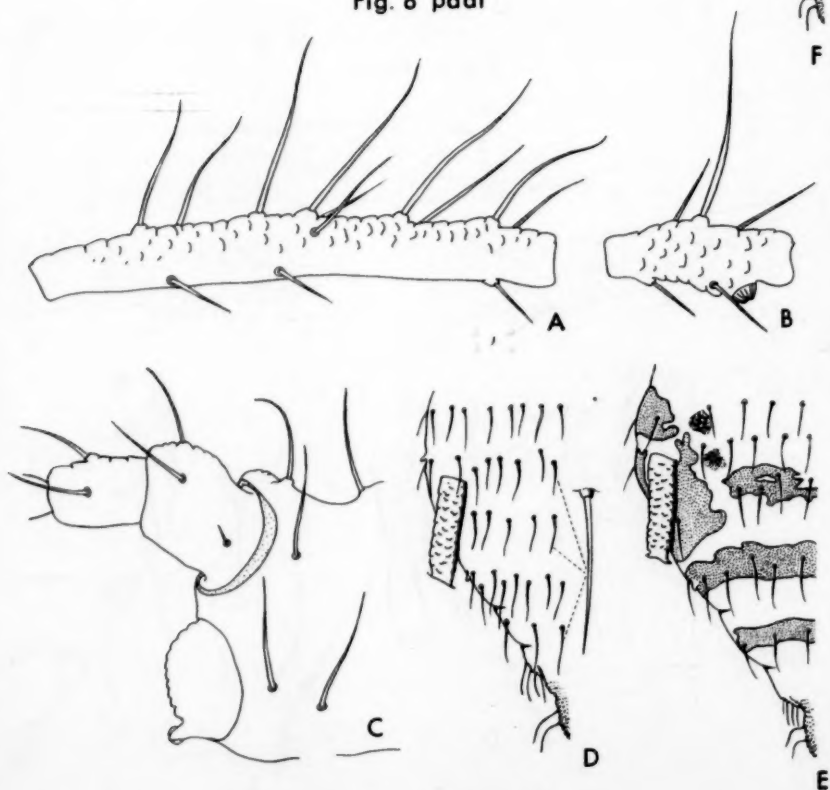


Fig. 9 rufiabdominalis

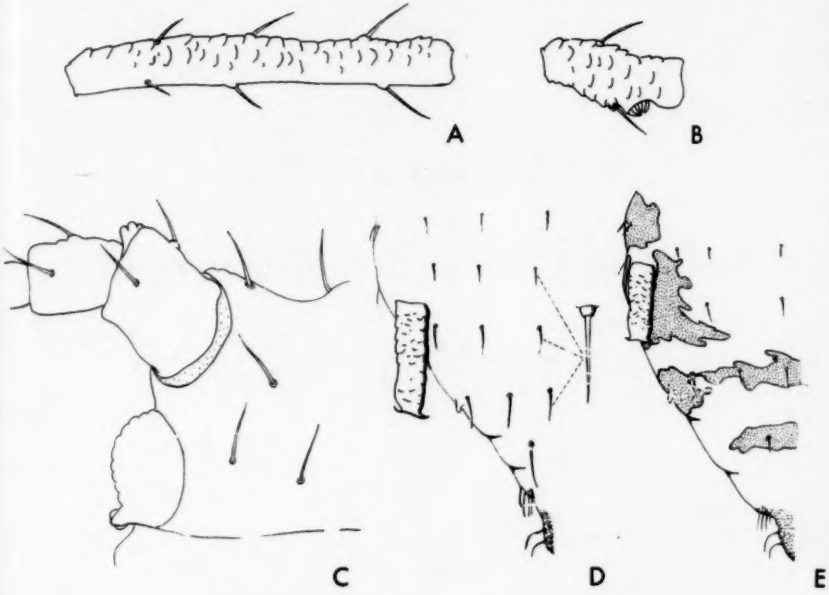


Fig. 10 *viridis*